

SMITHSONIAN
MISCELLANEOUS COLLECTIONS.

VOL. XIII.



"EVERY MAN IS A VALUABLE MEMBER OF SOCIETY WHO BY HIS OBSERVATIONS, RESEARCHES,
AND EXPERIMENTS PROCURES KNOWLEDGE FOR MEN."—SMITHSON.

C. A. T.

WASHINGTON:
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1878.

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JOSEPH HENRY,
Secretary S. I.

DEPARTMENT OF THE INTERIOR.

U. S. NATIONAL MUSEUM.

BULLETIN

OF THE

UNITED STATES NATIONAL MUSEUM.

VOLUME I.

(Nos. 1-10.)

PUBLISHED UNDER THE DIRECTION OF THE SMITHSONIAN INSTITUTION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1877.

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Department of the Interior:

U. S. NATIONAL MUSEUM.

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BULLETIN

OF THE

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CHECK-LIST

OF

NORTH AMERICAN BATRACHIA AND REPTILIA;

WITH A

SYSTEMATIC LIST OF THE HIGHER GROUPS,

AND AN

ESSAY ON GEOGRAPHICAL DISTRIBUTION.

BASED ON

THE SPECIMENS CONTAINED IN THE U. S. NATIONAL MUSEUM.

By EDWARD D. COPE.

WASHINGTON:
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1875.

ADVERTISEMENT.

This work is the first of a series of papers intended to illustrate the collections of Natural History and Ethnology belonging to the United States and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

JOSEPH HENRY,

Secretary Smithsonian Institution.

SMITHSONIAN INSTITUTION,

Washington, November, 1875.

Department of the Interior:

U. S. NATIONAL MUSEUM.

— 2 —

BULLETIN

OF THE

UNITED STATES NATIONAL MUSEUM.

N o . 2 .

PUBLISHED UNDER THE DIRECTION OF THE SMITHSONIAN INSTITUTION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1875.

CONTRIBUTIONS
TO THE
NATURAL HISTORY
OF
KERGUELEN ISLAND,

MADE IN CONNECTION WITH THE AMERICAN TRANSIT-OF-VENUS
EXPEDITION, 1874-75.

BY
J. H. KIDDER, M. D.,

PASSED ASSISTANT SURGEON U. S. NAVY.

I.
ORNITHOLOGY.

EDITED BY DR. ELLIOTT COUES, U. S. A.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1875.

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PREFACE.

The writer of the following notes has no pretension to the title of "naturalist", and deprecates criticism of any technical errors that may be found in his descriptions of the species.

He wishes to acknowledge the kind courtesy of Dr. Elliott Coues, U. S. A., who has undertaken to edit these notes, and has encouraged him to offer them for publication.

J. H. K.

BROOKLYN, N. Y., *July* 1, 1875.

INTRODUCTORY.

The various parties which had been organized for observing the transit of Venus in the southern hemisphere, five in all, were dispatched from New York on the 8th of June, 1874, in the United States ship *Swatara* (3d rate).

After short stoppages at Bahia and Cape Town, and an unsuccessful attempt to land a party on one of the Crozet Islands, the party to which the writer was attached was landed at the upper (northern) end of Royal Sound, a deep indentation in the southern part of Kerguelen Island, otherwise known as "Desolation Island." The landing was begun on September 10, and on the 13th the *Swatara* sailed again on her easterly course, having put up a sufficiently commodious living hut before her departure.

The party landed consisted of Commander Ryan and Lieut. Commander Train, astronomers, and Dr. Kidder, surgeon, all of the Navy; and Messrs. Holmes, Dryer, and Stanley, photographers. Besides these, there were a cook and carpenter belonging to the party, and three boys, stowaways from Cape Town, afterward turned over to the British man-of-war.

The preparation and registration of specimens was at first carried on in a small tent, to the great detriment both of the specimens and of the health of the collector, owing to the extraordinary dampness of the climate. Toward the end of October, a hut about ten feet square was erected, and a small stove set up, after which no more specimens were lost through insufficient drying.

Kerguelen's Island is a region of almost constant precipitation; only twenty-seven days out of four months being recorded as without snow or rain, and a still smaller number of nights. The thermometer ranged not far from the freezing-point; the daily average being a little below it in September and October, and a little above it in November and December. Whalers say that in midwinter there is no marked increase in the severity of the weather. The lowest thermometer recorded was 18° F., and the highest 64°. The island is also deservedly notorious for the violence of the gales, which almost constantly prevail, and which

often arise with a suddenness that makes it very dangerous to go about in small boats.

These climatic conditions have their natural effect upon the flora and fauna of the island; there being neither tree nor shrub—no plant, indeed, taller than the Kerguelen cabbage, while the very few species of phænogamous plants which do survive are such only as can thrive exposed to sudden and violent alternations of dryness and moisture and to fierce gales of wind. As a natural consequence of these facts, there are no land-birds or mammals, strictly speaking, indigenous to Kerguelen's Island, and but a single shore-bird (*Chionis minor*).

The island is of considerable size, about 90 miles long by 50 in width, and is composed, as to its southern part at least, wholly of volcanic rock, showing no signs of stratification. The northern portion contains stratified rocks, deposits of coal of little value, and very ancient remains of silicified wood, indicating the former existence of considerable trees, and the submergence and subsequent upheaval of the land upon which they grew. The whalers say that a large glacier runs across the island, in a generally east and west direction, at about its center. In the interior, the land is mountainous; peaks with sharp volcanic outlines alternating with table-topped hills. Mount Ross, the highest peak (about 5,000 feet), is always snow-covered and quite inaccessible. Near the sea, in December, the snow-line was found on Mount Crozier at about 2,600 feet above the sea-level.

No flying insects were observed excepting minute guats, and a Tineid* moth (which was perhaps imported), nor were the remains of any ever found in the stomach of any bird. *Chionis* and a teal were the only partial vegetable-feeders observed; all the other birds feeding exclusively on flesh, fish, or marine invertebrates.

Toward the middle of October, an English party, to observe the transit, established itself about fourteen miles to the southward and westward of the American station, including a naturalist, the Rev. A. E. Eaton, already known to science by his botanical collections in Spitzbergen. Accompanying this party were two men-of-war, which remained by them during their stay. On the other side, at about the same distance to the northwest, was a German party, landed from the N. G. frigate *Gazelle*, and to which Drs. Naumann and Huesker were attached as naturalists. The *Gazelle* was engaged in a scientific cruise throughout the southern

* Possibly the same as described by Rev. A. E. Eaton as *Embryonopsis Halticella* sp. nov., *Entomological Magazine*, Aug. 1875.

waters; being fitted for deep-sea dredging and general natural history work. A large room was set apart, on the starboard side of the gun-deck, for the use of the naturalists—a very unusual concession to science on a man-of-war.

On the 9th of December, the day of the transit, and fully three months before the Swatara could reasonably be looked for back again, the Monongahela arrived most unexpectedly, having been ordered to take the party off. Fortunately for the natural-history work, the astronomers detained the ship until January 11; but it is greatly to be regretted that the original programme was not carried out, and that the months of January and February were lost in so interesting a locality. Both the English and German parties remained at their stations, intending not to leave until about the middle of February. The Monongahela proceeded to Cape Town, arriving February 5, and the collections were sent thence by sailing-bark to New York.

According to Dr. Cones' determinations, the collection contains twenty-one species of six families—*Procellariidæ* eleven, *Spheniscidæ* four, *Laridæ* three, *Phalacrocoracidæ*, *Anatidæ*, *Chionididæ*, each, one.

BIRDS OF KERGUELEN ISLAND.

CHIONIS MINOR, *Hartl.*

LESSER SHEATH-BILL.—“WHITE PADDY” of whalers.

Chionis minor, HARTLAUB, Rev. Zool. 1842, pl. 2, f. 2.

GRAY & MITCH., Gen. of B. iii, 1849, pl. 136.

SCHLEGEL, Handl. Dierk. pl. 5; De Dier. fig. p. 232.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|------------------|-------|---------|---------|-------|-------|-------|-------|---------|-------------|---------------|------------------------------|
| 68956 | 27 | 1874. Oct. 12 | ♂ | 15.50 | 30.50 | 9.00 | ..... | 1.50 | 1.35 | 2.00 | 1.85 | 0.50 | Skin. |
| 68957 | 31 | Oct. 16 | ♂ | 14.00 | 29.00 | 8.50 | ..... | 1.35 | 1.65 | 1.85 | 1.60 | 0.45 | Do. |
| 68955 | 32 | Oct. 16 | ♂ | 15.00 | 31.00 | 9.50 | ..... | 1.50 | 1.60 | 1.80 | 1.60 | ..... | Skin with sternum. |
| ..... | 33 | Oct. 18 | ♂ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Disemboweled and in alcohol. |
| 68958 | 67 | Nov. 14 | ♂ | 15.75 | 32.00 | 9.35 | ..... | 1.50 | 1.75 | 1.75 | 1.60 | 0.40 | Skin. |
| ..... | 127 | Dec. 5 | ♂ (?) | 15.00 | 30.00 | 9.00 | 4.65 | 1.45 | ..... | 1.65 | 1.55 | 0.50 | Alcohol. |
| ..... | 146 | Dec. 11 | ♂ (?) | 14.50 | 29.00 | 8.50 | ..... | ..... | ..... | 1.75 | 1.50 | 0.50 | Do. |
| ..... | 203 | Dec. 29 | ♂ (?) | 16.50 | 30.50 | 9.00 | 4.85 | 1.50 | ..... | 1.85 | 1.75 | 0.50 | Alcohol and carbolic acid. |
| ..... | 204 | Dec. 29 | ♀ (?) | 15.25 | 29.15 | 8.85 | 4.50 | 1.35 | 1.65 | 1.75 | 1.65 | 0.50 | Do. |
| ..... | 205 | Dec. 29 | ♀ (?) | 15.50 | 29.85 | 8.85 | 4.75 | 1.35 | 1.65 | 1.75 | 1.55 | 0.45 | Do. |
| ..... | 206 | Dec. 29 | ♀ (?) | 15.75 | 28.85 | 8.50 | 4.75 | 1.35 | 1.75 | 1.75 | 1.65 | 0.50 | Do. |
| ..... | ..... | 1875. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | 232 | Jan. 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Sternum of No. 32. |

Bill black and conical. On its upper surface a hood-shaped horny sheath, turned upward at its extremity, and not at all “erectile” so far as my observation extends (see Cuvier, An. King., *Chionis necrophaga*). This sheath measures from 0.45 to 0.85 in different individuals, being rather larger in the male than in the female. The nostrils are separate and of large aperture.

Eyelids pale-pink, whence the *Chionis* is often called by the sealers the “sore-eyed pigeon”. A black caruncle extends from the base of the sheath upward to the front of the eye, both in males and females; more prominent in the former, and especially after the birds have paired.

Iris purplish-black.

Body entirely pure white. A scaly, black, blunt spine projects from the carpal joint of the wing (in the male) 0.35 to 0.40. In the female, this spur is represented only by a small knob, which is flesh-colored.

The plumage is very soft and light. Underlying the white plumage is a dense coat of slaty-blue down, similar to that usually found on sea-birds.

Tarsus and *foot* dull white, with a flesh-tint; scaly and stout. Toes 4; not palmate; fourth toe placed above and on the inner side of the tarsus.

Tail, spreading widely in flight, nearly square.

Testes slate-colored, and of small size so late as November 11.

Intestines contained fragments of sea-weed and beaks of cephalopods. The small intestine of No. 67 (original number) measured 29 inches and the large 19 = 48 in all. There is a distinct crop and muscular gizzard; also, a marked dilatation of the small intestine beyond the pylorus, as if the latter divided the stomach into two portions, one muscular and the other membranous. Gizzard internally rugose.

Eggs pointed, about as large as those of a guinea-fowl, and marked with brown streaks. Three were found in the only nest of which I have reliable information, and these were marked in different shades (*unct.* Rev. Mr. Eaton, naturalist to English transit-party).

The *Chionis* was one of the first birds observed after landing at Kerguelen Island. On the way up from the Swatara's first anchorage to the final station selected, one of these birds alighted on the boat hoisted at the stern of the ship, and remained there for a considerable time, showing no fear of the persons standing upon the poop, and seemingly much interested in their movements. One of the first specimens taken was captured by hand, by Mr. Russell, of the New Zealand party; he having enticed the bird near to him by means of a dead one, killed with a stone.

They were quite common in particular parts of the island, near the American station, especially in the neighborhood of the "rookeries" of the cormorant (*Graculus carunculatus*) and of the rock-hopper penguins (*Eudyptes chrysolophæ*), and upon rocks at and near high-water mark. In these localities, I have often observed them for hours at a time; their remarkable fearlessness and curiosity rendering it easy to get near them. On the 15th of October, for example, seeing a considerable number on the rocks at some distance away, I walked and climbed slowly toward them. They would scarcely get out of my way, seeming greatly interested in my movements; and when I sat on a stone, keeping perfectly still, the whole party, twelve in all, came up to examine the intruder. They walked all around me, coming almost within reach; others flying up from more distant rocks to join them, and finally stopped, almost in a semicircle, for a good stare. I watched them at these close quarters

for an hour or more, and saw no sign of any power of erecting the horny sheath, attributed to them by Cuvier. They run with great rapidity upon the rocks, avoiding the little pools left by the tide, and seem disinclined to flight. When flying, they have a peculiar note, strongly suggestive of the "chat" of the common blackbird. The call at rest is a short rattling croak. I could not see that they ate or sought for any other food than a soft green sea-weed, which they stripped up with their bills, shaking the water out with a rapid flitting motion. I have, however, found in their stomachs the beaks of cephalopods, together with vegetable matter; and some that we afterward partially domesticated ate greedily of fresh meat. One that was kept for some time on the Monongahela showed a strong *penchant* for eggs, breaking the shells with its beak as if the operation were no novelty to it. On no occasion, however, did I observe any sign of the carrion-feeding propensity which has given a name to the Australian species (*C. necrophaga*, Vieill.). On the evening of December 14, after skinning a sea-elephant, I went down at dusk to watch some other birds feeding on its carcass, already beginning to putrefy. A *Chionis* flew by, alighted near at hand, and, after a short time, moved on without going up to the carcass, although the latter was nearly covered with sea-birds.

On the occasion first mentioned, after watching the birds for a time, I shot four specimens, not without compunction on account of killing such trustful acquaintances. When I walked off to get a sufficient distance away for a shot, the whole troop started to follow me, making little runs and stopping, as if filled with curiosity. I shot all four without moving from the spot, reloading for each, the birds not all flying out of range even after the gun had been fired. On subsequent occasions, various members of the party captured specimens by hand; all that was necessary to attract them within reach being to remain perfectly still. After one had been caught, it served as a lure for others. When taken home alive, they still showed no fear, but, when let loose in the house, took food readily, and, oddly enough, fought fiercely among themselves, using only their bills, however, and not the wing-spurs. None of us ever saw them fighting in the open air. When confined in a coop, they cluck and peck at the wood-work so like domestic fowls that I once arose in the night to shut the kitchen-door, supposing that the chickens, of which we had several, had come into the house. Although seemingly absolutely without fear, the specimens that we tried to domesticate bore confinement very illy, constantly beating themselves, during the day, against the

bars of their cage. When let loose, they would often stay for several days near the house, feeding as peaceably among the chickens as tame pigeons. One, whose wing had been clipped, remained about the house for some weeks, but finally wandered off, and was probably killed by a *Lestris*, since I found its carcass, partly devoured, about a mile from the house.

Opinions differed as to their edibility; the Germans considering them the best bird on the island, while the whalers said that they would "do very well when very short of fresh meat". We did not experiment upon them at all, the flesh being dark and apparently tough.

The *Chionis* is one of the latest, if not the very latest, of the Kerguelen birds in pairing and nesting. They were observed to have begun to pair December 11; but no egg was found until January 10, the day of our departure, when the Rev. Mr. Eaton found several nests. To his courtesy I am indebted for my only specimen, unfortunately not accompanied by any description of the nest, except a message that it was found near the sea. From Captain Fuller, of the whaling-schooner Roswell King, however, I learn that the Sheath-bill is famous for its skill in concealing its nest, never going near its eggs while any one is in sight. He states that they build in the crevices formed by rocks that have fallen upon or against one another, and that the nests are constructed of dried grass. There were three eggs in the nest from which my specimen came, marked in different shades of color. I am quite positive that, up to January 5, none of the *Chionis* living near our station had begun to lay, since I kept them under the closest possible observation, being particularly anxious to get their eggs. The eggs are of unusually large size in proportion to that of the bird.

QUERQUEDULA EATONI, Sharpe.

EATON'S TEAL.

Querquedula eatoni, SHARPE, Ibis, July, 1875, p. 328 (quoted from advance sheets).

I was entirely at a loss for a name for this teal; but, just as these sheets were going to press, I received, through the courtesy of Mr. Salvin, advance proof-sheets of the "Ibis", in which it is described as new. Mr. Sharpe's description is reproduced in the accompanying foot-note.*

* "♂. supra brunneus, plumis plurimis griseo marginatis, rufescenti-fulvo maculatis aut fasciatis: scapularibus nigricantioribus: pileo paullo rufescentiore plumis nigro medialiter striatis; facie laterali et gutture albicantibus, minutè nigro striolatis, mento fulvescenti-albo: corpore reliquo subtùs albicante, brunneo marmorato, plumis plerisque pectoralibus versùs basin griseo-brunneis aut medialiter brunneo striatis: hypochondriis brunneis, albido terminatis et rufescenti-fulvo transfasciatis: subcaudalibus rufescenti-fulvis, nigro adumbratis, longioribus nigricantibus fulvo terminatis; tectricibus alarum

A rather small duck, the sexes of which differ but little (chiefly in the vividness of the alar speculum). Head and neck minutely speckled with blackish-brown and light-brown or brownish-white—the top of the head darkest, the sides of the head, the neck, and especially throat lightest. Upper parts brownish-black; all the feathers broadly skirted with rusty-brown and pale-gray. Under parts dull whitish, mottled throughout with brown, more uniform and of a richer shade on the breast, in larger pattern on the sides and crissum. Axillars white, with dark-brown cross-bars; lining of wings dark-brown, with paler or white edgings of the feathers. Wing-coverts plain grayish-brown, or, in the ♀, with narrow rusty-brown edgings; the greater row of coverts tipped with orange-brown, paler or whitish in the ♀. Speculum iridescent green, with purplish and violet reflections, immediately bordered with black, this in turn margined with white on the ends of the secondary quills. In the ♀, the green speculum is dull, and tinged with brown. Primaries fuscous-brown; tail-feathers the same, with pale edges, and irregular oblique rusty-brown markings, like broken V-shaped bars. The tail-feathers are all lanceolate-acuminate, and the tail as a whole is acute.—C.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Longest toe. | Middle claw. | Remarks. |
|---------------------------------|------------------|------------------|------|---------|---------|-------|-------|-------|-------|---------|--------------|--------------|---|
| 68974 | 34 | 1874. Oct. 18 | ♀ | 15.60 | 27.00 | 8.50 | 4.50 | 1.35 | 1.85 | 1.35 | 1.50 | 0.25 | Skin; stomach contained isopods. |
| 68973 | 68 | Nov. 15 | ♂ | 17.25 | 29.50 | 9.10 | 5.50 | 1.50 | 2.00 | 1.50 | 1.60 | 0.25 | Skin; stomach contained gravel and isopods. |
| 68975 | 207 | Dec. 29 | ♂ | 19.05 | 29.75 | 9.10 | 5.25 | 1.50 | 1.85 | 1.35 | 1.50 | 0.35 | Skin; stomach contained gravel only. |

Bill lamellate, greenish-gray at sides, black at tip and above, covered with skin, and finely toothed within. Tongue fleshy, toothed on posterior half of dorsal surface.

Nostrils oval.

Iris purplish-black.

Head and *neck* brown, finely mottled with white, lighter over throat. In some males, the mottling varies, being finer and lighter, with green reflections at sides of head.

Plumage generally dark-brown or black, tipped with white and mottled with paler shades of brown. Secondaries and tertiaries of wings edged with a narrow white band. Above this, in the male, is a band

superioribus cinerascanti-brunneis, majoribus pallidè badio terminatis, fasciam alarem formantibus; remigibus cinerascanti-brunneis, secundariis extùs purpureo bronzeis albandò terminatis, speculum alarem bronzinum vix sub certâ luce olivascente nitentem exhibentibus: secundario proximo nigricante vel aspectu externo viride nitente, medialiter cinerascante strigato, albo apicato: secundariis interioribus nigricantibus extùs pallidè brunnescentibus albo limbatis: rectricibus mediis nigricantibus, reliquis brunneis albo marginatis, nonnullis rufescenti-fulvo notatis: tectricibus subalaribus brunneis, inferioribus intimis et axillaribus albis brunneo maculatis, tectricibus majoribus cinerascanti-

one inch wide of lustrous changeable green, then a band of orange-brown one-fourth inch wide.

Tarsus and *foot* ocher-yellow to dirty pale-green.

Claws black; posterior nail very short and much elevated; the other three covered by skin beneath to their extremities.

Tail pointed.

Stomach is muscular and generally contains gravel.

These birds, which became the principal dependence of our party in the way of fresh provisions, are very abundant on the island, but generally shy and difficult of approach. They were to be found inland, where I have seen them as high as 2,500 feet above the sea-level, and on the sea-shore when the tide was falling. They feed upon the roots of the *Azorella selago*, grass-seeds, earth-worms, and larvæ, and the small crustaceans which swarm along the sea-shore. They are strong in flight, rising readily from both land and water, and run upon the land like grouse or quails, with little of the clumsiness or waddling gait of other ducks.

It is probable that they begin to pair about November 10, since I observed pairs already formed, and the birds chasing one another in the air, etc., on November 14. They frequent the banks of brooks and the higher land during the breeding-season, and begin to lay about November 15, building a rather deep nest on the ground, generally near the water, under a tussock, and well concealed by grass, deep, hemispherical, and lined with feathers from the breast of the female. There are four or five pale olive-green eggs, about three-fourths the size of a hen's egg. Upon leaving the nest, the female covers her eggs with feathers, disposing the neighboring grass with considerable art so as to conceal

bus alæ inferiori concoloribus: rostro plumbeo, culmine nigro: pedibus cinerascens, membranis interdigitalibus nigris. Long. tot. 15.5, alæ 8.5, caudæ 4.8, tarsi 1.2.

"♀. mari similis sed speculo alari absente, secundariis albo terminatis: caudâ brunneâ, rufescenti-fulvo fasciatim marmoratâ.

"*Hab.* in insulâ Kerguelensi.

"This plain-coloured Teal is allied to *Q. gibberifrons* and *Q. creccoides*. From the former it is at once to be distinguished by the fawn-coloured bar on the wing and the bronzy speculum, the wing-bar being broadly white, and the speculum black in *Q. gibberifrons*.

"*Q. creccoides* resembles *Q. eatoni* in having the fawn-coloured wing-bar; but then the speculum is black, and the greater part of the bill is yellow.

"*Q. eatoni* also has the axillaries whitish barred with brown, whereas they are quite white in the allied species, and, moreover, it has remains of rufous-buff bars on most of the feathers of the upper surface, the back being uniform in the other species. Altogether the species seems very well pronounced. Besides the three examples brought by Mr. Eaton, I have found in the [British] Museum three Kerguelen Island skins, collected during the voyage of the 'Erebus' and 'Terror.'

them, and if caught in the act of sitting, or near her nest, will often counterfeit lameness until the intruder has been enticed to a safe distance. If the drake be shot during the pairing-season, the female will remain near the body; when the female falls, on the contrary, the drake generally flies merrily away. The note of the female is a plaintive whistle; that of the drake a sonorous "quack", usually repeated three times.

These birds do not migrate at all from Kerguelen Island, nor is there any other member of the family *Anatidæ* there represented. They are very palatable, and, since we never shot more at a time than were actually needed, served us for the table during the whole time of our stay.

GRACULUS CARUNCULATUS (Gm.).

CARUNCLED CORMORANT.—"SHAG."

Pelecanus carunculatus, GMELIN, Syst. Nat. i, 1788, p. 576, No. 25 (based on the Carunculated Shag, LATH., Syn. iii, 2, p. 603, No. 19).

Pelecanus cirrhatus, GMELIN, Syst. Nat. i, 1788, p. 576, No. 28 (based on the Tufted Shag, LATH., Syn. iii, 2, p. 606, No. 22).

I have no hesitation in identifying this species as above, although the single adult specimen collected does not show the white transalar fascia spoken of by authors. Schlegel, moreover, quotes it from the present locality. The caruncles, which are conspicuous features of the adult breeding bird, constitute two prominent yellow masses symmetrically disposed on the naked forehead at each side of the base of the upper mandible. The head and neck are lustrous, deep steel-blue, with purplish and violet reflections, contrasting notably with the rich dark-green back, the color of which is uniform, the feathers having no differently-colored edges. The entire under parts, from the bill, on a line along each side of the neck, are pure white.—C.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Longest toe. | Middle claw. | Remarks. |
|---------------------------------|------------------|-------------------|-------|---------|---------|-------|-------|-------|-------|---------|--------------|--------------|-----------------|
| 68976 | 20 | 1874. Sept. 25 | ♀ | 23.50 | 40.00 | 10.00 | 5.50 | 1.75 | 3.50 | 2.00 | 3.35 | 0.35 | Skin. |
| ..... | 118 | Dec. 4 | ..... | 5.00 | 4.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Young; alcohol. |
| ..... | 191 | Dec. 24 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Do. |
| ..... | 192 | Dec. 24 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Do. |
| ..... | 193 | Dec. 24 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Do. |

Bill black; upper mandible sharply hooked; lower straight. Nostrils 2, extending nearly to point of bill. Caruncles at base of bill brilliant yellow. Eyelid cobalt-blue.

Iris yellow.

Head and *body* brilliant changeable steel-blue, with violet tints along back of head and neck. Back and upper surfaces of wings and tail lustrous dark-green. Throat from the bill and all under parts, pure white. During the breeding-season, the bird carries an erectile crest of about a dozen small plumes upon the top of the head.

Tarsus and *foot* yellow.

The foregoing description is taken from a female in breeding-plumage.

Eggs two or three in number, pale-green.

Young perfectly naked for some time after hatching, black, and showing no sign of plumage. Bill black. Feet clumsy and misshapen; bones still cartilaginous, pale, and transparent. Abdomen very protuberant. December 24, a young bird had begun to show a hairy sort of plumage along the margins of the wings and about the rump.

Only a single adult skin of this cormorant was preserved and brought home, a female in nuptial plumage. There is no better reason, I am afraid, for this omission than the fact that the birds were exceedingly plentiful and the preparation of the skins a very tedious job, so that it was put off from day to day for rarer specimens, until, in the hurry of an unexpectedly early departure, it was omitted altogether. From memory, I can only say that the young birds were of much more sober plumage than the females, destitute of the crest and brilliant blue eyelid, and generally rather smaller. All had white breasts and bellies; but there were many minor variations in plumage, which I suppose to indicate differences in age.

They do not differ materially in habits from other species of cormorant, diving and swimming well, feeding entirely on fish, and often congregating for hours upon a projecting rock or headland, where, in pairing-time, they enact various absurd performances, billing and curveting about one another in a very ridiculous manner. The note is a hoarse croak, which never varies, so far as I have observed. They seem to be on particularly good terms with the *Chionis*, and are often joined by gulls when sunning themselves.

They build upon shelves, for the most part in the precipitous faces of cliffs overlooking the water; the base of the nest being raised sometimes as much as two feet, and composed of mingled mud and excrement. Upon this pedestal is constructed a rather artistic nest of long blades of grass. Apparently, they continue to use the old nests year after year, adding a new layer each season, and thus building the nest

up. The first eggs were found November 5; there being sometimes two and sometimes three in a nest. They were procured at first by the kind assistance of Mr. Stanley, and a length of rope which tied us together, one end being knotted around the waist of each. One would then remain above and hold on, while the other clambered a little way down the face of the cliff and secured the eggs. After a time, however, I discovered a lot of nests, near a rookery of "rock-hopper" penguins, accessible from below, where, on December 4, the young birds were first observed. Eggs green, with white chalky incrustation.

The young are most ridiculous-looking objects, being pot-bellied, naked, and perfectly black, and seem to be less advanced in development at the time of hatching than most birds, the bones of the tarsus and foot being not yet ossified. Small fish were generally lying by the nests. The old birds were very solicitous about their young, hissing and stretching out their necks, and refusing to leave their nests until pushed off. Yet, when I took one of the young away from the nest and placed it close by on the rock, the mother seemed neither to recognize its constant chirping nor to be aware that one of her brood was missing. Certainly she paid no attention to it. The odor in the neighborhood of the nesting-places was most offensive.

The young birds are infested with a tick of prodigious size, specimens of which have been preserved.

BUPHAGUS SKUA ANTARCTICUS, (*Less.*) *Coues.*

SOUTHERN SKUA.—"SEA-HEX."

Lestris catarractes, QUOY & GAIMARD, Voy. Uran. Ois. pl. 38.

Stercorarius catarractes, p., SCHLEGEL, Mus. Pays-Bas, fasc. iv, 1863, *Lari*, p. 45.

Lestris antarcticus, LESSON, Traité d'Ornith. 1831, p. 616.

GOULD, B. Aust. vii, pl. 21.

SCLATER, Proc. Zool. Soc. 1860, p. 390.

ABBOTT, Ibis, 1861, p. 165.

SCLATER & SALVIN, Ibis, 1869, 284.

SCLATER & SALVIN, Proc. Zool. Soc. 1871, 579.

PHILIPPI & LANDBECK, Cat. Av. Chili, p. 47.

HUTTON, Birds New Zeal. 1871, p. 39.

Stercorarius antarcticus, BONAPARTE, Consp. Av. ii, 1856, p. 207.

PELZELN, Orn. Novara Reise, p. 150.

Buphagus antarcticus, COUES, Proc. Acad. Nat. Sci. Phila. 1863, p. 127.

Buphagus skua b. antarcticus, COUES, Birds Northwest, 1874, p. 605.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|-----------------|-------|---------|---------|-------|-------|-------|-------|---------|-------------|---------------|---------------------------------------|
| 68960 | 26 | 1871. Oct. 4 | ♀ | ..... | 54.00 | ..... | ..... | 2.50 | 4.00 | 3.00 | ..... | ..... | Skin (from Mr. Stanley). |
| 68959 | 42 | Oct. 27 | ♂ | 21.00 | 54.00 | 16.00 | 7.25 | 2.25 | 3.15 | 3.00 | 2.85 | 0.65 | Skin. |
| ..... | 139 | Dec. 10 | ..... | 35.50 | 58.50 | 17.25 | 7.35 | 2.35 | 3.25 | 2.65 | 3.00 | 0.75 | Alcohol, with eggs. |
| 68961 | 188 | Dec. 24 | ♀ | 23.75 | 54.00 | 15.50 | 6.35 | 2.35 | 3.15 | 2.85 | 2.65 | 0.75 | Skin with eggs. |
| ..... | 262 | Dec. 19 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Specimen injected with carbolic acid. |

Bill black.

Iris very dark steel blue.

Body generally dark-brown, mottled with black; basal parts of primaries showing as a broad white band beneath the wings during flight. Back sparingly mottled with dirty white. A single white feather often found near and below carpal joint of wing, among the coverts. Second primary longest. Considerable differences in general tint were observed, even in the same pair, some being very much paler than others. Stomach muscular; contents not identified, except in one case, when bits of egg-shell were found.

Tarsus and *foot* greenish slaty-black, sentellated. Claws black, long, and strongly hooked.

There being no land-birds on Kerguelen Island besides *Chionis*, the office and most of the habits of a buzzard-hawk have been assumed by this great skua. It was at first taken for a hawk by all of us; its manner of flight, watchfulness of the ground over which it flew, and habit of perching on spots commanding a wide view all suggesting this impression. It was, indeed, difficult to believe the evidence of my own senses when I found a web-footed bird avoiding the water and preying solely, so far as my observation extended, upon other birds. When any of the party went out shooting, he was pretty sure to be followed by one or two "sea-hens", as the sealers call them, and had often to be very prompt to secure his game before it should be carried off in his very presence. Mr. Train tells me that he had one day to stand, while reloading, with his foot upon a teal which he had shot, a skua swooping down constantly after it if he stepped away even for a couple of yards. On another occasion (October 21), the same gentleman had crippled a teal, which was carried off, still living and not badly hurt, before his

eyes, so that he had to shoot the skua to secure his game. November 21, in order to settle the question whether they attack and kill their own game when it is unhurt, Mr. Stanley and I dug up, by the aid of the dog, a well-grown and nearly-fledged young bird (supposed to be of *Majaqueus aquinoctialis*), as large as an ordinary domestic fowl. A pair of skuas being near at hand, watching our proceedings, I threw the young bird up into the air, so that it flew some distance and alighted perhaps two hundred yards away from us. One of the skuas immediately flew up to it, and killed it by repeated blows upon the head with its beak; the other remaining at some distance, on guard, as I at first thought, but, as afterward appeared, afraid of its mate; for, while we stood watching the first skua eating its capture (nearly as large as itself), the other approached by degrees, uttering short, plaintive chirps, but not daring to share in the meal. When, after a few minutes, we drove them off, the abdomen of the petrel had been torn open, and its entrails partly devoured. I could not see that its claws were used in tearing its prey; it seeming rather to depend upon the strength of its beak. On another occasion (December 18), a fully-grown *Majaqueus*, sitting, which had been dug up and probably slightly bruised by the dog, alighted in the sea after a short flight, and was at once fiercely attacked by a skua. The petrel showed extreme fear, uttering piercing shrill cries, and turning over to fight at each swoop, but finally took wing again and escaped.

I saw this skua on one occasion feeding amicably with the gulls astern of the ship when at anchor (December 28); and, on January 18 one was seen flying about the Monongahela for a few minutes, she being then about three hundred miles from the nearest land. As a general rule, its habits are terrestrial, and on the few occasions when, probably after poor success in hunting, I have seen it alight in the water, it has held its wings up perpendicularly, like a butterfly, as if afraid of wetting them. At the pairing-season, this trick of holding up the wings becomes quite a prominent characteristic. Two will alight upon a knoll, quite near together, holding their wings perpendicularly in the air, and set up a vociferous cackling. The note is loud, harsh, and hoarse, suggestive of the cry of the gull.

I have never seen *Buphagus* pursue gulls to make them disgorge their food. On the contrary, both gulls and terns combine to drive them away as soon as they come into their neighborhood, particularly while nesting. I even on one occasion saw a single gull driving a skua away from the neighborhood of its nest. On the 15th of October, I shot and wing-

tipped one of these birds so that it fell into the water. It seemed unusually alarmed, looking up into the air, crying out hoarsely with a note unlike its usual call, and swimming very slowly for a web-footed bird. The great number of gulls which collected at once and began to attack it explained its fright, and it seemed to suffer so greatly that I fired into it again after a few minutes, and spoiled my specimen. It is noteworthy that, whereas other sea-birds when wounded invariably swim out to sea, this one endeavored to gain the land, plainly looking in that direction for safety, although I stood upon the shore, directly in its way.

Eggs were first found November 17, two in number, marked by irregular chocolate-colored blotches upon an olive-drab ground, and measuring 2.75-3.00 by 1.50 inches. The nest is a shallow cavity in the long grass (*Festuca*), lined sparingly with grass-stems, and always in a dry spot. The old birds make it very lively for the egg-hunter, attacking him on opposite sides with great vigor and determination, and keeping up an outcry that is really appalling. They are very skillful in leading one astray from the locality of their nests, never going near it when any one is in sight, so that it was a good while before I found the second nest, although I had spent more time in this quest than in pursuit of any other single object while on the island. Seeing a skua fly by the house one day (December 7), apparently going somewhere in a great hurry, I therefore snatched up a revolver (no gun being at hand) and followed him. He was going to join the female on her nest, as I suspected, and when I approached both attacked me as usual. I succeeded in killing the male, but emptied the revolver at the female without success, and was kept standing for certainly twenty minutes, pelting the enraged bird with stones as she swooped down at my head, with the two eggs in plain sight, but not daring to pick them up. A lucky throw finally disabled her, and I secured the eggs, which were very much paler than those gathered theretofore, and quite fresh. I suppose that this pair had been so often disturbed by our near neighborhood that they were later than usual in laying.

It would seem that these birds pair once for all, since a single couple holds possession of each meadow-district, allowing no intruders; and since two were almost always seen together during our stay. An odd bird, whose mate had probably been shot, and which had a ragged wing from some stray charge of small shot, used to circulate around from district to district, being always attacked by both male and female as soon as seen. On the 20th December, however, I saw seven near

together in one meadow. On the same day, I found a single egg in a nest which I had robbed December 3. I did not succeed in finding the young, but heard of a pair being seen on December 26.

I cannot say how far the habits of "*Lestris catarrhaetes*," the northern representative of this bird, agree with what has been related of *Buphagus*. The latter certainly seems to me a remarkable instance of modification of habit, and even of form, resulting from the peculiar circumstances in which it is placed. As among marsupials, where that type prevails, we find representatives of almost every tribe of mammals, so here there is a sea-bird occupying the place of a tribe as far removed from it structurally as the Tasmanian devil is from the fox. I should think it even probable that the introduction of a few pairs of hawks, could they accommodate themselves to the conditions of the island, would relegate this skua very shortly to its proper place as a fish-feeder, and to the habits of its northern congeners.

A very interesting incident, although not directly related to its natural history, occurred in connection with one of these birds on December 17. On that day I scored one on the back of the head with a revolver-bullet so as to open the brain-cavity. It turned back-somersaults for twenty minutes without cessation, until I killed it, in fact. No matter what position it was put in, it immediately stretched out its legs and wings, and pushed itself over backward. Placed in the water, it endeavored to execute the same manœuvre, and was near working itself out of reach from the shore. The specimen was injected with carbolic acid and preserved. The corresponding effect, that resulting from a wound of the cerebrum only, was at another time illustrated in a gull (see *Larus*), and both incidents recalled strikingly Dr. Weir Mitchell's interesting experiments, performed some ten years ago upon pigeons.

LARUS DOMINICANUS, Vieill.

SOUTHERN BLACK-BACKED GULL.

Larus dominicanus, "VIEILLOT".—LICHTENSTEIN, Verz. Doubl. Mus. Berol. No. 846.

BLASIUS, J. f. O. 1865 (pub. 1866), p. 378.

Larus azare, "LESSON, ex Azara 409".

Dominicanus azare, BONAPARTE, Consp. Av. ii, 1856, p. 214.

Dominicanus vociferus, BRUCH, J. f. O. 1853, p. 100; 1855, p. 281.

Dominicanus pelagicus, BRUCH, J. f. O. 1853, p. 100, pl. 2, f. 3; 1855, p. 280.

BONAPARTE, Consp. Av. ii, 1856, p. 214.

Larus vetula, "BAILLON".

Dominicanus vetula, BRUCH, J. f. O. 1853, p. 100, pl. 2, f. 4; 1855, p. 281.

BONAPARTE, Consp. Av. ii, 1856, p. 214.

Dominicanus fritzei, BRUCH, J. f. O. 1855, p. 280 (*L. fuscus*, Fritze).

BONAPARTE, Consp. Av. ii, 1856, p. 214.

Larus antipodum, GRAY.

Dominicanus antipodum, BRUCH, J. f. O. 1853, p. 100, pl. 2, f. 3; 1855, p. 231.

BONAPARTE, Consp. Av. ii, 1856, p. 214.

Clupeilarus antipodum, BONAPARTE.

Larus verreauxi, BONAPARTE, Rev. Zool. 1854, p. 7; Naum. 1854, p. 211.

Dominicanus verreauxi, BRUCH, J. f. O. 1855, p. 231.

Clupeilarus verreauxi, BONAPARTE, Consp. Av. ii, 1856, p. 231.

Larus capensis, "SMITH, MSS." (Gray.)

Larus fuscus, "FRITZE". (Gray.)

Larus littoralis, "FORSTER". (Gray.)

Larus antarcticus, "ELLMAN". (Gray.)

The bird from Kerguelen's Land appears to be the particular style of southern black-backed gull to which the term *antipodum* has been applied. The bill is very heavy—as Bonaparte says, "*rostro crassissimo fere gabanum simulante*". But I have no faith whatever in the specific distinctions which Bonaparte, Bruch, and others have sought to establish among these forms, and do not hesitate to bring them all under one head, following Schlegel and Blasins.—C.

List of specimens, with measurements.

| Southsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|----------|------|---------|---------|-------|-------|-------|-------|---------|-------------|---------------|--------------------------------------|
| 68965 | 25 | 1874. | | | | | | | | | | | |
| | | Sept. 29 | ♀ | 23.00 | 49.00 | 15.25 | 7.00 | 1.85 | 2.85 | 2.75 | 2.00 | 0.40 | Skin; adult. |
| 68964 | 58 | Nov. 7 | ... | 22.75 | 50.05 | 15.00 | 8.00 | 1.75 | ..... | 2.40 | 2.15 | 0.40 | Skin; young; failed to identify sex. |
| 68966 | 83 | Nov. 18 | ♀ | 22.50 | 51.50 | 16.00 | 7.80 | 1.50 | 2.40 | 2.25 | 2.20 | 0.40 | Skin; adult. |
| 68967 | 84 | Nov. 21 | ♀ | 22.40 | 49.25 | 15.10 | 6.50 | 1.60 | 2.50 | 2.25 | 2.00 | 0.35 | Skin; young. |
| 103 | | Nov. 26 | ♀ | 23.75 | 54.50 | 16.00 | 6.60 | 1.65 | 2.60 | 2.60 | 2.25 | 0.30 | Skin; adult. |
| 68968 | 156 | Dec. 14 | ♀ | 22.00 | 53.00 | 15.00 | 6.75 | 1.60 | 2.80 | 2.50 | 2.10 | 0.30 | Skin; young. |
| | | 1875. | | | | | | | | | | | |
| 219 | | Jan. 2 | ... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Young; alcohol. |
| 220 | | Jan. 2 | ... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Do. |
| 221 | | Jan. 2 | ... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Do. |

Bill, adult, saffron-yellow; a red spot at the eminentia symphysis. Young (No. 58) black, with a white spot over nostrils; line of symphysis of lower mandible white; (84) pale-pellow, irregularly streaked with black, *black* spot on pyramidal portion of lower mandible; (156) yellow, streaked with black, *no* spot on lower mandible. The measurements are of the "chord of the culmen." From the gape, the bill measures from 2.25 to 2.70 inches.

Iris, adult, mustard-yellow. Young (Nos. 58 and 156) brown-gray; (84) bright-yellow.

Head, adult, white; eyelid coral to deep orange-red. Young, head and neck brown, more or less mottled with white; eyelid (No. 84) gamboge.

Body, adult, back and wings slaty-black, excepting a band of white, about one inch, at ends of primaries and secondaries; primaries with the usual *pictura*; neck, breast, belly, tail, and under parts of wings

pure white. Young generally brown, mottled with black and white. Tail of No. 58 shows a black band at tip, while that of No. 156 is tipped very narrowly with white. The intermediate specimens have the white tips of primaries in various approximations to adult plumage.

Tarsus and *foot*, adult, yellow, with a greenish tint posteriorly. Young pale-gray (156), yellowish-gray (84), or ash-colored (58), the scutellated line being darker than the rest.

Claw black.

Stomach muscular, containing remains of shell-fish.

Young (unfledged) reddish-brown, mottled with black.

Eggs three in number, olive-green, mottled with black or very dark-brown.

These very handsome gulls were seen first in Table Bay in July, and afterward near the Crozet Islands. They are readily recognized by the broad, white, fringe-like band along the free edge of the wings. At Kerguelen they were very plentiful, breeding upon the island. So late as November 18, I note that the ovaries were not greatly enlarged, but that "the birds show a good deal more excitement than usual of late, circling high in air, making a great outcry, and frequently leaving their feeding-grounds to fly inland in considerable numbers". Two nests were found December 21, containing each three olive-green eggs, plentifully marked with black blotches. The nests were built up of grass and seaweed, and were very wet within, situated just beneath the edge of herbage that fringes the shingle-beaches. All of the eggs contained feathered embryos. I had been looking for them upon the higher land, where the birds had for some time had a habit of alighting in considerable numbers, and hence had overlooked them at the time of first laying. We generally avoided the rough shingle in walking along the shore.

Excepting some signs of excitement already noted, and a tendency to congregate in considerable numbers high in the air, noticed early in November, there was never any very obvious sign that the gulls were pairing; no selection of mates or diminution of sociability. They nest also upon low land, at some distance from the sea. In such a spot, I found several young birds on January 2.

They have several different notes or cries: one, which is uttered when the bird is swimming, at some distance from the others, has been mistaken more than once for a human call of distress; another, uttered when many are together, is like the cry of the laughing-gull. There is a sort of "creak", uttered when the bird is swinging itself lazily along in the air, and a series of short calls, like the mewling of a kitten,

that I have only heard when near their nests. It was this last call, given by gulls high overhead, that directed me to the nesting-place where the young were found, January 2.

The plumage is very variable, according to age, as usual with gulls, seeming to indicate several different species. None of these birds examined which were not in full plumage showed any enlargement of the genital organs. One specimen was seen flying which had almost acquired the adult plumage, excepting only that the head, neck, and under parts were sparingly mottled with gray. The fringe of white at the ends of the primaries and secondaries was quite distinct.

On the 14th December, while watching the various birds which had gathered about the carcass of a sea-elephant upon the beach, I observed that gulls do not, in feeding from the surface of the water, use their feet and claws as instruments of prehension. They dip the bill down, seizing their prey by its aid only, even when at some little distance beneath the surface, and, at the same time, strike the water sharply with their expanded feet, thus getting an upward impulse, which maintains their flight. Two little white-rumped petrels (*T. Wilsonii*), seen on that day for the first time in broad sunshine, performed the same manœuvre in a much more dexterous and obvious manner than the gulls.

At this same time, I shot a specimen in unusually dark plumage with No. 7 shot, and at very long range. The bird seemed stupefied, but there was no external mark of injury except one shot-hole behind and above the right eye. When secured, it struggled violently, neither wings nor legs being in the least injured; but, left to itself, it showed no fear of, or wish to avoid me, stared about stupidly for a few moments, and presently put its head under its wing. I wanted to secure the better-marked specimen already mentioned, which was flying near with the rest of the flock, and, intending to take advantage of the sympathy which gulls always show for a wounded companion, set my capture on a little knoll, and retired to some distance. It put its head under its wing as before, and, although exposed to a fresh breeze which was blowing, seemed to have no difficulty in maintaining its balance. Not succeeding in drawing the specimen I wanted within range, I finished my bird after a little with a charge of small shot (No. 9), and preserved the specimen (No. 156). I omitted to mention that, when thrown up into the air, it seemed to have full power of flight, but to lack the inclination. I suppose that in this case the centers of reflex action remained intact, while such intellect as the bird possessed was paralyzed by a shot in the cerebrum.

STERNA VITTATA, Gm.

Wreathed Tern, LATHAM, Gen. Syn. iii, pt. ii, p. 359, No. 11.

Sterna vittata, GMELIN, Syst. Nat. i, 1788, p. 609.

LATHAM, Ind. Orn. ii, 1790, p. 807, No. 12.

GRAY, Gen. B. iii, 1849, p. 659.

BONAPARTE, Comptes Rend. xlii, 1856, p. 772.

PELZELN, Orn. Novara Reise, 1865, p. 152 (very full account).

Sterna albigriata, GRAY, Voy. Erebus and Terror, pl. 21.

Hydrochelidon (Pelodes) albistriata, GRAY, Handlist, iii, p. 122, No. 11073.

The fine series of this Tern collected by Dr. Kidder agrees minutely with specimens from New Zealand in the Smithsonian, identified with *albistriata* of Gray by myself some time since. It is a true *Sterna*, with a close general resemblance to *S. arctica* or *macrura* of authors; with very long and deeply-forked tail, white or nearly so; the whole body pearl-gray, not apparently paler below than above, but fading into pure white along the sides of the black cap, giving the appearance of a white stripe on each side of the head; bill and feet coral-red.

But there appears to be an earlier name for this species, in the *S. vittata* of Gmelin, based on the "Wreathed Tern" of Latham, from Christmas Island. The descriptions of both these authors apply perfectly well to the specimens in hand; and these are evidently the same as that described in detail by Pelzelin, *l. c.*, who figures the egg (pl. vi, fig. 14). Pelzelin quotes the species from Kerguelen (Mus. Brit.), St. Paul Island (Exp. Novara), New Zealand (Mus. Vindob.), and Cape of Good Hope. Gray does not give *vittata* in the "Handlist"—a circumstance tending to confirm my conviction that his *albistriata* is the same bird. Besides the two names above quoted, there are some others of partial pertinence, or supposed applicability to this Tern, which may be regarded as the antarctic representative of *S. macrura*, as the *Euphagus* of this region is of the true *B. skua*, or *Larus dominicanus* of *L. marinus*.—C.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Foot. | Longest claw. | Remarks. |
|---------------------------------|------------------|-------------------|------|---------|---------|-------|-------|-------|-------|---------|-------|---------------|-----------------|
| 68947 | 18 | 1874. Sept. 24 | ♂ | | | | | | | | | | Skin. |
| 68948 | 19 | Sept. 24 | ♂ | | | | | | | | | | Do. |
| 68949 | 20 | Sept. 24 | ♂ | | | | | | | | | | Do. |
| 68944 | 38 | Oct. 21 | ♂ | 11.15 | 29.00 | 10.25 | 4.15 | 1.35 | 1.50 | 0.75 | 0.75 | 0.25 | Skin with egg. |
| 68945 | 64 | Nov. 10 | ♂ | 13.00 | 28.50 | 9.75 | 5.75 | 0.90 | 1.60 | 0.60 | 0.80 | 0.25 | Skin. |
| 68946 | 65 | Nov. 10 | ♂ | 13.00 | 28.00 | 19.00 | 5.50 | 1.15 | 1.60 | 0.75 | 0.75 | 0.25 | Young; alcohol. |
| ..... | 116 | Dec. 3 | ♀ | 5.50 | 7.00 | | | | | | | | Do. |
| ..... | 149 | Dec. 11 | ♀ | | | | | | | | | | Do. |
| ..... | 150 | Dec. 11 | ♀ | | | | | | | | | | Do. |
| ..... | 151 | Dec. 11 | ♀ | 12.50 | 28.50 | 10.00 | 5.35 | 1.45 | 1.65 | 0.85 | 0.75 | 0.30 | Alcohol. |
| ..... | 194 | Dec. 24 | ♀ | | | | | | | | | | Young; alcohol. |
| ..... | 196 | Dec. 24 | ♀ | 13.25 | 28.25 | 9.75 | 5.75 | 1.55 | 1.25 | 0.75 | 0.75 | 0.30 | Skin. |
| 68943 | 197 | Dec. 24 | ♂ | 13.00 | 28.00 | 10.10 | 5.40 | 1.50 | 1.50 | 0.65 | 0.75 | 0.25 | Do. |
| ..... | 198 | Dec. 24 | ♂ | 13.80 | 28.40 | 10.25 | 5.75 | 1.60 | 1.60 | 0.75 | 0.75 | 0.25 | Alcohol. |
| ..... | 218 | 1875. Jan. 2 | ♂ | | | | | | | | | | Young. |

Bill coral-red.

Iris very dark-blue.

Head black-capped; a line of white feathers along lower margin of upper mandible extending backward one-half inch; a white streak

from the eye backward, as wide as the eye itself, fading into pearl-gray; throat and cheeks pearl-gray.

Body generally pearl-gray; rump white.

Tail paler on its upper surface than the rest of the body, forked, the left fork usually the longer [?].

Tarsus and *foot* coral-red.

Claes brown or black; sometimes black with brown tip.

Stomach always contained isopod crustaceans, rolled up into balls.

Young, when first fledged, is yellow-brown, spotted irregularly with black; its bill, toes, and tarsus dirty-orange, blackening toward tips. Later, the colors grow darker, feet and tarsi becoming orange-red. The young is as large as a chick, and as unlike the adult as possible.

Egg is single; of a brownish-green, blotched irregularly with black; pointed at small end; and measures 1.78 by 1.22 inches.

This pretty and fearless little tern was, perhaps, the most familiar object on the island; several of them being always to be seen during daylight winnowing the air over the masses of kelp (*Macrocystis pyrifera*) which covered the waters of the bay by the station. They dive readily from a considerable height in the air, rarely missing their mark, a good-sized isopod crustacean, which seemed to constitute their sole diet. During the pairing-season (October), they remind one forcibly of the common sparrow; curveting around one another, with wings half-spread, and constantly chattering. They are very bold, showing scarcely any fear of man, and excited much the same kindly regard in all of us as the robin and such familiar birds do at home.

They nest on rather high and broken ground, usually under the lee of a tuft of grass, and with little or no preparation. Sometimes a few dried stalks are laid together in the bottom of a barely perceptible cavity; oftener a tuft of dead azurella-leaves, found ready to hand, serves their turn. An egg was first found November 7, very early in the laying-season, owing to the excessive solicitude of the old bird, which flew at me as I passed with amazing ferocity, snapping her bill, screaming, and making a curious sound, very like the "gritting" of teeth. Had she kept quiet, I should not have observed the egg at all. On November 10 I note that many pairs had selected nesting-places, but had not yet begun to lay. A young bird was first found December 4, so like the ground in color that I was near stepping on it. It is very large and heavy, and unlike the adult. On December 11, I got two young birds, and shot the old one belonging, as I supposed, to one of them. I must,

however, have confounded two different individuals when following it with my eye, since the nest over which the one I shot was hovering proved to contain an unhatched egg. Its mate flew up pretty soon from the sea, alighted by the dead body, and seemed to try to arouse it, poking at it with its bill. Failing in this, he presently crept on to the egg himself, assuming his mate's place and function. It is by no means uncommon to find a male petrel or albatross sitting, but I was not before aware that the practice was followed by terns.

The nests are built not far from the sea, usually upon the slope of a hillside, where drainage is good, and generally there are a good many near together. Upon the approach of man, dog, or skua, a warning scream is sounded, and the whole colony at once fly up and make common cause against the intruder. The skua is actually afraid of them, and it is a steady-nerved man who will not dodge the vicious swoops made from time to time at his head. So near do they come on these occasions that most of my specimens were knocked down with stones while flying.

DIOMEDEA EXULANS, *Linn.*

THE ALBATROSS.

Diomedea exulans, LINNÆUS, Syst. Nat. i, 1766, p. 214, and of authors.

Diomedea spadicea, GMELIN, Syst. Nat. i, 1788, p. 568.

Diomedea albatrus, PALLAS, Zoog. Rosso-As. ii, 1811, p. —

FORSTER, Deser. Anim., ed. Licht. 1844, p. 27.

Diomedea adusta, TSCHUDI, J. f. O. 1856, p. 157.

—C.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|------------------|------|---------|---------|-------|-------|-------|-------|---------|-------------|---------------|-------------------|
| 68949 | 181 | 1874. Dec. 18 | ♂ | 50.50 | 130.00 | 29.00 | 10.00 | 6.50 | 4.75 | 4.85 | 6.70 | 1.00 | |
| 68950 | 251 | 1875. Jan. 2 | ♀ | 46.85 | 123.00 | 26.50 | 9.00 | 6.50 | ..... | 5.00 | 6.50 | 1.00 | Young of year(?). |

Bill white. Young of year pinkish-white.

Iris very dark-blue to purple.

Body generally white in adult; some of wing primaries, secondaries, and tertiaries being black, with fine, wavy, dark lines across parts of wing-coverts and back. The amount of black marking is variable, but appears to diminish with every moult. The young of the year are

quite black, or very dark-brown, excepting the under parts of wings, throat, and cheeks, which are white, more or less mottled with black.

Tail very short in proportion to the size of the body.

Tarsus and *foot* white, with pale-blue tint, scutellated.

Claes white. No rudiment of hind toe.

Stomach membranous, filled with an oily fluid.

Eggs single, white.

None of these birds had shown themselves in the neighborhood of our camp until December 17, when Mr. Train captured and brought in the specimen No. 181, which he had carried more than two miles. It was found near an old nest, seemingly about to rebuild it, but no egg was found until December 30. On the 2d of January, the steam-launch of the *Monongahela* carried me several miles down the beach to the low strip which connects Prince of Wales Foreland with the mainland. Here I saw very many albatrosses nesting upon hillocks, built up some two feet, or more, from the ground. The nests are composed mostly of grass, and, being of different heights, seemed to have been used again, and added to, year after year. I counted twenty-three birds in sight at one time, each perched upon its nest. Being conspicuous by the whiteness of their plumage, and rarely very near together, they rather remind one of the whitewashed cairns set up by surveyors. Driven from the nests, and compelled to walk, they look not unlike overgrown geese. The distribution of their weight compels them to stretch out their necks horizontally, and to walk with a widely-swaying gait. Two approached each other as I was watching them, and went through with some very odd manœuvres. One raised its head and spread out its wings as if to embrace the other, which remained with wings folded. Both then clattered their bills, and touched them together, first on one side and then on the other. This manœuvre was repeated several times. *Phæbæria fuliginosa* has the same trick of touching bills with its mate and clattering the mandibles about pairing-time; but I have never seen them approach one another with outspread wings. All of the nesting albatrosses that I saw, without exception, showed a slight pinkish discoloration of the neck, as if a blood-stain had been washed out, usually on the left side, and extending downward from the region of the ear.

They are dull birds, making but little attempt to defend their eggs beyond loudly clattering their bills. The sound thus produced is louder than would be expected, owing to the resonance of the considerable cavity included by the mandibles. It is very like the sound of a tin

pan beaten with a stick. I knocked several off with my heavy overcoat twisted up like a rope, and secured their eggs before they recovered sufficiently to approach the nests. They climbed on to the empty nests again, however, and sat as contentedly, to all appearance, as before. I believe that they do not lay a second time. Certainly, the nest robbed December 30 was still empty January 2, although occupied by the old bird; and the whalers, who are very fond of the eggs, assert that they never find a second one in a nest that has been once robbed.

I have read somewhere that albatrosses and penguins nest together, but cannot see how it is possible. The king-penguin is the only one nesting in low land (as I am told), but none were found in this neighborhood. The eggs would be frequently immersed in water, unless raised on similar pedestals to those which the albatrosses build. (See *Aptenodytes*.)

The specimen No. 251, which is almost entirely black, was captured at sea, January 19, in latitude $39^{\circ} 28' S.$, and longitude $64^{\circ} 33' E.$, along with several others more or less marked with black. It is believed to be a young bird of the preceding year.

PHÆBETRIA FULIGINOSA, (*Gm.*) *Reich.*

SOOTY ALBATROSS.—“PEE-ARR” of sealers.

Diomedea fuliginosa, GMELIN, Syst. Nat. i, 1788, p. 563, and of authors generally.

Diomedea (Phæbetria) fuliginosa, BONAPARTE, Consp. Av. ii, 1856, p. 186.

Phæbetria fuliginosa, COUES, Proc. Acad. Nat. Sci. Phila. 1866, p. 186.

Diomedea spadicea, LESSON, Man. ii, 1828, p. 391.

Diomedea antarctica, “BANKS, ic. ined. 26”.

Diomedea palpebrata, FORSTER, “ic. ined. 102”; Deser. Anim., ed. Licht., 1844. p. —.

Diomedea fusca, AUDUBON, Orn. Biog. v, 1839, p. 116, pl. 407; Syn. 1839, p. 335; B. Am. vii, 1844, p. 200, pl. 454. —C.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|------------------|-------|---------|---------|-------|-------|-------|-------|---------|-------------|---------------|---|
| 68952 | 37 | 1874. Oct. 30 | ♂ | 37.00 | 80.00 | 22.00 | 13.35 | 4.25 | 4.25 | 3.30 | 4.50 | 0.60 | Only head, foot, and sternum preserved. |
| 68951 | 53 | Nov. 2 | ♂ | 37.00 | 84.00 | 22.00 | 13.00 | 4.15 | 4.00 | 3.00 | 4.75 | 0.75 | Skin with egg. |
| 68953 | 54 | Nov. 2 | ♀ | 34.00 | 78.00 | 20.00 | 13.00 | 4.15 | 3.75 | 3.25 | 4.05 | 0.75 | Do. |
| ..... | 254 255 | Nov. 21 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Embryo with egg. |

Bill black, with a pale streak, similar in form to that of *Diomedea*, but much smaller, more compressed, with different outline of feathers at base.

Head mouse-colored, paler on the top and back than elsewhere.

Iris purple-gray. Eyelid covered with very small white feathers in a line one-eighth inch wide, above and behind eye. There are no other white feathers on the bird.

Body generally mouse-colored, darker on wing-coverts and back.

Tail pointed while the bird is flying, often fan-shaped while bird is at rest, the central feathers being the longest.

Tarsus and *foot* pale flesh-colored. *Tibia* naked 1.50 inches.

Clares horn-white. Very small rudimentary hind toe.

Stomach membranous; contained beaks of cephalopods and green fibrous masses supposed to be vegetable.

Two specimens of the sooty albatross were brought into the camp on October 16, having been captured at the entrance of a shallow cave in the face of a rock some distance inland. They were kept about the huts for some days, showing no disposition to leave. One was hurt by the dog, however, so that it died, when the other quite unexpectedly walked to the edge of a rock, spread its wings, and flew off. The dead bird was much mutilated, so that I have preserved only its head, foot, and sternum, with the measurements. The flesh was unusually pale and soft, as if the bird were young of the year.

October 24, two of the dusky albatrosses had made a nest upon a shelf formed by a considerable tuft of cabbage and azorella, at the entrance of a small cavity in the perpendicular face of a lofty rock, near the top of a hill some two miles away. Here the birds could be both seen and heard. Their scream is very loud, and not unlike one of the calls of a cat. At a distance, it has often been mistaken for the hail of a man. The name "pee-arr" has been given as descriptive of this call, which is, I believe, peculiar to the breeding-season. Another pair was seen same day circling around the same hill-top. No eggs. November 2, secured one egg and both birds. The nest is a conical mound, seven or eight inches high, hollowed into a cup at the top, and lined rudely with grass. The male was sitting when captured; the female standing on another old nest, not far away, but higher up the face of the rock. There was no evidence of an intention to rebuild the old nest. Both birds, but particularly the male, showed fight when approached, clattering their large bills with an odd noise, and biting viciously when they got a chance. The male is perceptibly the larger bird of the two. The oviduct of the female was distended, and no other egg seemed to be on its way from the ovary, making it probable that she had just laid the

Bill pearl-gray, with a flesh-tint, to pale bone-yellow.

Iris dark.

Head dirty-brown, lighter than the rest of the body, with white spot of variable extent on the chin.

Body generally very dark-brown, the under parts being lighter than the upper. Feathers on belly and under side of wings tipped with reddish-brown. Testicles very small December 14 in No. 155. Stomach membranous.

Tail fan-shaped.

Tarsus and *foot* dirty-black, brownish-gray in young. *Tibia* naked for 2.35 inches.

Claws streaked-black and yellowish-white. Distinct hind claw.

The "Nellies", as the whalers call them, were first seen in the bay by our station on October 3, after which date they became quite common. One was shot October 5 while flying over, but the specimen was not preserved. It was a female, and apparently a young bird, the flesh being unusually soft and pale. The sealers told me that they nested near by, and began to lay late in December. I found the young birds, however, on January 2, in the hollows between clumps of *Azorella*, almost fledged, and quite as large and heavy as the adults. They are exceedingly filthy birds, ejecting the contents of their stomachs for two or three feet from their bodies, and seeming to have a limitless supply to draw upon. Among the vomited matters I noticed many penguin-feathers. No old birds were to be seen at the time. Several young were found near together, and three were secured as specimens. In the same neighborhood was a young bird of an earlier brood, fully fledged, but not yet able to fly. Unless, therefore, there is more than one brood in a season, these petrels must be among the earliest to lay, instead of one of the latest, as we had been told.

I found the adult birds, in considerable numbers, feeding on the carcass of the sea elephant, December 14. With their huge whitish beaks, lighter-colored heads (then covered with clotted blood), and disordered dun plumage, they reminded me strongly of vultures. Like vultures, also, they had so crammed themselves that they were unable to rise from the ground, although it was sufficiently rocky and irregular for them to do so with ease under ordinary circumstances. They waddled and stumbled to the sea, swam away, and did not rise into the air until half an hour or more of digestion, and perhaps of vomiting, had made it possible. I shot two on this occasion; but one succeeded in getting into

the water with a broken wing. The individual secured vomited copiously, as soon as wounded, an immense mass of undigested blood, fat, and intestines. The preparation and preservation of its skin was anything but a pleasant job, and, indeed, they are the filthiest birds by far found on the island. I have never heard any sound from the Nelly, nor did I find any eggs. I never saw them attack other living birds, but have found them several times eating carrion.

MAJAEQUEUS ÆQUINOCTIALIS, (Linn.) Reich.

“STINKER” of *whalers*.

Procellaria æquinoctialis, LINNÆUS, Syst. Nat. i, 1766, p. 213.

GMELIN, Syst. Nat. i, 1788, p. 564.

LATHAM, Ind. Orn. ii, 1790, 821.

And of authors generally.

Procellaria æquinoxialis, VIEILLOT, Nouv. Dict. d'Hist. Nat. xxv, 1817, p. 422.

Prionius æquinoctialis, “HOMBIG. et JACQ.”

Majaqueus æquinoctialis, REICHENBACH, Syst. Av. pl. 20, f. 340, 341.

BONAPARTE, Consp. Av. ii, 1856, p. 200.

COUES, Proc. Acad. Nat. Sci. Phila. 1864, p. 118.

Puffinus capitis bonæ-spei, BRISSON, Orn. vi, 1760, p. 137.

Procellaria nigra, FORSTER, Descr. An., ed. Licht. 1844, p. 26.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|---------|-------|---------|---------|-------|-------|-------|-------|---------|-------------|---------------|------------------------|
| ..... | 29 | 1874. | | | | | | | | | | | |
| ..... | 69 | Oct. 14 | | 20.00 | 54.00 | 15.00 | ..... | 2.90 | 2.50 | 2.50 | 3.25 | 0.65 | Skin. |
| ..... | 177 | Nov. 15 | ♂ | 21.00 | 52.00 | 15.34 | 6.00 | 2.35 | 2.75 | 2.75 | 3.00 | 0.55 | Do. |
| ..... | 178 | Dec. 16 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Alcohol; not measured. |
| ..... | 179 | Dec. 16 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Do. |
| ..... | 179 | Dec. 16 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Do. |

Bill worn (apparently) to greenish-white, remaining black in sutures. Upper mandible strongly hooked; lower much less so. Nostrils tubular, distinct, and inclosed in a separate horny sheath. Upper mandible composed of four pieces; lower, of three. No cere.

Iris black.

Head black, excepting a white spot around base of lower mandible, and for one inch below and behind it.

Body generally black; a small tuft of white feathers on abdomen.

Tail, middle feathers longest.

Tarsus and *foot* greenish-black and scutellated.

Claws black. Distinct hind claw.

Stomach internally rugose and partially muscular; contained the remains of crustaceans and beaks of cephalopods.

A single specimen of these birds (No. 29) was dug up by the dog on October 12 from a very deep burrow under a clump of *Azorella*, but none others were seen until November 15, when they suddenly appeared in the day-time in considerable numbers. On December 16, I dug up specimens with eggs, and frequently thereafter. They nest in very deep burrows, with almost always a little pool of water at their entrance, and keep up an incessant squealing while the dog is digging for them, very like the sound of the water-whistle toys, or "whistling coffee-pots", sold on the street-corners. The note is, in other words, very shrill, and constantly trilling. They fight the dog more bravely than any other petrels, generally coming out of the burrow hanging to his ear, and keeping him off very successfully on the open ground. It was one of these birds that has been elsewhere spoken of as being attacked by a skua while in the water.

The name "stinker" is fully warranted by the rank odor emitted by the bird, and is given on the authority of the whalers on the schooner *Emma Jane*. Captain Fuller, however, of the schooner *Roswell King*, a very careful observer, tells me that the stinker is a much larger bird, and that it nests on the ridges of the high hills, not in burrows, and very late in the season. If so, I have never seen it.

On December 18, while out in a boat, at some distance from the station, I saw very many black petrels, both swimming and flying, which strongly resembled these birds in every respect, except that they had not the white throat-spot described above.

An embryo (No. 185) has been preserved in alcohol.

Egg is single, white.

One of the first birds dug out by the dogs after our arrival, on September 15, was a large petrel, covered everywhere by long, gray, hairy down, and found quite near the station. They were found often afterward, and were much hunted by the dogs as food. From their squealing when captured, the structure of their bills, the depth of the burrows in which they were found, the black plumage of those subsequently taken, and their offensive odor, I supposed them to be the young of *Majaqueus*, but was assured by the whalers that they were "Mutton-birds", and of quite a different species. A curious circumstance with regard to them is the fact that I never succeeded in getting any positive clew to the old birds to which they belonged. At different times, I set snares in front of the burrows, and sprinkled light dry earth within its entrance,

but never captured any birds; nor did I ever find any tracks upon the earth. It certainly seemed as if the old birds had finally abandoned them. It must be remembered, also, that one of these young birds was found as early as September 15, and that I found *Majaqueus* *with egg* on December 15. The "Mutton-birds" had certainly not begun to fly before December. The two specimens preserved were captured on November 10; the wings of No. 62 being then in full feather, but the body still partially covered with down.

No. 62, 16 by 38.75 by 12; bill, tarsus, and foot black; iris dark-blue. No. 66, 13.50 by 32 by 8; bill, tarsus, and foot black; iris dark-blue; younger than 62. [Not seen by me—probably some *Puffinus*.—E. C.]

ÆSTRELATA LESSONI, (*Garn.*) *Cass.*

WHITE-HEADED PETREL.

? *Procellaria alba*, GMELIN, Syst. Nat. i, 1788, p. 565.

VIEILLOT, Nouv. Dict. d'Hist. Nat. xxvii, 1817, p. 420.

? *Daption album*, SHAW, Gen. Zool. xiii, 1825, p. 246,

? *Procellaria variegata*, "BONNATERRE". (*Bp. & Gray.*)

Procellaria lessoni, GARNOT, Ann. Sc. Nat. vii, 1826, p. 54, f. 4.

LESSON, Traité d'Ornith. 1831, p. 611.

GOULD, B. Aust. vii, pl. 49.

REICHENBACH, Syst. Av. pl. 24, f. 2605; pl. 20, f. 339.

Æstrelata lessoni, CASSIN, Proc. Acad. Nat. Sci. Phila. 1862, p. 327.

COUES, Proc. Acad. Nat. Sci. Phila. 1866, p. 142.

Rhantistes lessoni, BONAPARTE, Compt. Rend. xlii, 1856, p. 768.

Procellaria leucocephala, FORST., Descr. An., ed. Licht. 1844, p. 206.

GOULD, Ann. Mag. N. H. xiii, 1844, p. 363.

Æstrelata leucocephala, BONAPARTE, Consp. Av. ii, 1856, p. 189.

Procellaria vagabunda, "SOLANDER". (*Gray & Bp.*)

This is a large, stout species, with a strong bill, and, in adult plumage, very handsome. What is more important, in some respects, it is likewise one of the better-marked species of this difficult and thoroughly-involved group. I have reason to believe that its characters, relationships, and synonymy are worked out in my monograph above cited with fidelity and consequent reliability. Passing over some early names, of probable but unproved application to this species, it seems that *lessoni* of Garnot is the prior tenable name, though some authors give preference to *leucocephala* of Forster. When this name was first proposed I have no means of knowing, but I trace no published record of it back of 1844. This species has been figured by several authors, and is, or should be, now well known. In lieu of further remarks, I beg to refer to the paper already mentioned.—C.

Measurements of a specimen.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|------------------|------|---------|---------|-------|-------|-------|-------|---------|-------------|---------------|----------|
| 68969 | 211 | 1874. Dec. 29 | ♀ | 18.15 | 43.00 | 12.15 | 5.85 | 1.50 | 2.50 | 1.85 | 2.20 | 0.50 | Skin. |

Bill black, very stout and strongly hooked.

Iris very dark-brown.

Head pearl-gray; black shading around eyes; throat white.

Body, back gray; dark-brown to black over wings; breast and belly white; tail pearl-gray.

Tarsus and *foot* flesh-pink; black along upper surfaces of digits and on the web near the claw.

Claws black.

A bird was brought to me on September 19, which I then pronounced to be a fulmar, but which I now believe to have been an individual of this species. Unfortunately, being much occupied with other work, and supposing these to be common, I disregarded it and did not preserve the specimen. It never afterward came under my personal notice. Mr. Eaton, naturalist of the English party, visited us on December 9, and then told me that he had found a specimen, and, on December 29, the specimen preserved was brought home alive by one of the men, having been dug out of a very deep burrow by the dog, at a considerable distance inland, and well up among the hills. He found no egg. I saw them following the ship on January 18, about seven hundred miles north of Kerguelen.

ÆSTRELATA KIDDERI, *Coues*.

KIDDER'S PETREL.

Procellaria grisea, KÜHL, Mon. Proc. Beit. Zool. 1820, p. 144, No. 15, fig. 9. *Not of Latham*.

SCHLEGEL, Mus. Pays-Bas, 1863, p. 9. Exclusive of syn. "*solandri* Gould".

Æstrelata grisea, COUES, Proc. Acad. Nat. Sci. Phila. 1866, p. 148.

"*Procellaria lugens*, FORST., icon. 21", according to Kuhl.

"*Æstrelata inexpectata*, FORST.", BONAP., Consp. Av. ii, 1856, p. 189, but not of Forster.

"*Procellaria unicolor*, GOULD". (*Fide Gray*.)

The single specimen of this bird brought home by Dr. Kidder is of special interest and importance. It is of a species I never saw before, but one of which, with a degree of sagacity which proves equally unexpected and gratifying, I introduced a compiled account in my monograph, judging it to be, from the published descriptions, different from any one with which I was then acquainted.

The characters of this bird agree exactly with the accounts given both by Kuhl and Schlegel, *ll. cc.*, of a bird they call *Procellaria grisea*; and there is no reasonable question that all three of us have the same species in view. But there is little if any probability that it is the same as *P. grisea* of Latham, which is described as having the bill two inches long, &c. (see what is said Proc. Acad. Phila. p. 148, foot-note, and p. 149, text). In my monograph, I permitted "*grisea* Kuhl" to stand, as the names fell in different so-called genera; but the groups are so closely allied, and birds of this genus are so commonly called "*Procellaria*", that it will tend to prevent future misunderstanding to apply to this species a new name. And, in so doing, I take pleasure in recognizing, to this slight extent, the excellent service which the author of this paper has rendered in extending, and especially in increasing the precision of, our knowledge of southern oceanic birds.

For the characters of this species, and further discussion of some technical questions concerned, I would refer to the monograph already cited. The bird is a typical *Æstrelata*, of the group of smaller species that cluster around *mollis* of Gould and *cookii* of Gray ("genus" *Cookilaria* Bp.). It has every appearance of being a young bird, in dark whole-colored plumage, like others of this group when immature; but finding it breeding, with the egg, settles the question of its maturity. The whole plumage is dark-gray, nearly uniform, but sootier on the back and wings than on the under parts, with a peculiar glaucous shade throughout. The bill is very short, hardly over an inch long, and extremely *thin*, though deep and strongly hooked. Other proportions are indicated by Dr. Kidder's measurements below.—C.

Measurements of a specimen.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Foot. | Claw. | Remarks. |
|---------------------------------|------------------|------------------|------|---------|---------|-------|-------|-------|-------|---------|-------|-------|----------------|
| 68970 | 39 | 1874. Oct. 21 | ♂ | 14.00 | 34.50 | 10.15 | 4.05 | 1.10 | 2.05 | 1.45 | 1.50 | 0.35 | Skin with egg. |

Bill black.

Skin thickly covered with fat within.

Plumage nearly uniformly sooty-gray, with a slightly bluish cast.

Tail, middle feathers longest.

Tarsus and *foot* dusky.

Clares black.

Egg single, white, 2.00 by 1.50 inches.

These birds were found October 11, with eggs, in rather deep burrows, each one of which contained a little pool of fresh water, close by where the egg was deposited. They squealed shrilly when captured, with a note very like that of *Majaqueus*. The only specimen preserved was taken, with an egg, October 21. A young bird, taken December 13, and much resembling the young "mutton-bird" (see *Majaqueus*), but far less advanced than the latter at that date, I believe to belong to this species, although the evidence is not positive. It made no sound when taken from the burrow (specimen No. 160).

These birds were common in burrows near our station early in October, and were neglected for others more difficult of access, under the supposition that they would always be at hand. After October 21, however, I never saw another adult specimen, and Mr. Eaton informed me in December that he had not yet found it at all. Doubtless, more diligent collecting and observation of the birds while they were still comparatively plentiful would have cleared up the doubt which seems still to exist as to their specific position among *Æstrelata*. Their neglect is

only another instance of the tendency, which so often causes mortification and chagrin to the collector, to postpone those objects which are familiar and common for others mistakenly supposed to be rare and urgent. As Dr. Hooker has so feelingly said, "These are, however, questions which propose themselves to us in the closet only, when the prospect of solving them is gone by; and when they but add to the thousand regrets over lost opportunities, the remembrance of which weighs so heavily on the mind of every naturalist that the brightest prospects of discovery in the fair future can never obliterate them."—*Flora Antaretica*, vol. ii, p. 465.

Perhaps the disappearance of these birds about the end of October may be explained on the supposition that they are really rare in the locality under consideration; but that we had, in selecting a station, stumbled upon one of their nesting-places, and actually dug up nearly or quite the entire community.

OCEANITES OCEANICA, (*Kuhl*) *Coues*.

WILSON'S STORMY PETREL.

Procellaria pelagica, WILSON, *Amér. Ornith.* vi, 1808, p. 90, pl. 60, fig. 6, nec auct.

Procellaria oceanica, KÜHL, *Beit. zur Kennt. Proc.* 1820, p. 136, pl. 10, f. 1.

BONAPARTE, *Journ. Phila. Acad.* iii, 1824, p. 233.

Thalassidroma oceanica, GRAY, *G. of B.* iii, 1849, p. —.

Oceanites oceanica, COUES, *Proc. Acad. Nat. Sci. Phila.* 1864, p. 82.

Procellaria wilsoni, BONAPARTE, *Journ. Acad. Nat. Sci. Phila.* iii, 1824, p. 231, pl. 8, f. 3, 3^a, and pl. 9, lower fig.

Thalassidroma wilsoni of many authors.

Oceanites wilsoni, KEYS. & BLAS., *Wirb. Europ.* ii, 1840, p. 238.

BONAPARTE, *Consp. Av.* ii, 1856, p. 199.

I have looked at a great many "Wilson's Petrels" from various parts of the world without having been able to see any difference between them. In any event, the bird here presented is the original "*oceanica*" of Banks, Kuhl, &c.—it is the other one, *wilsoni* Bp., 1824, which is to be cut away from this one, if any division is attempted. Bonaparte has the thing hind part before in his *Conspectus*.—C.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|-----------------|------|---------|---------|-------|-------|-------|-------|---------|-------------|---------------|----------|
| 68933 | 209 | 1874 Dec. 30 | ♂ | 6. 17 | 14. 00 | 5. 35 | 2. 50 | 0. 55 | 0. 85 | 1. 30 | 0. 85 | 0. 25 | Skin. |
| 68932 | 210 | Dec. 30 | ♀ | 6. 50 | 14. 50 | 5. 60 | 2. 60 | 0. 60 | 0. 95 | 1. 35 | 1. 00 | 0. 25 | Do. |

Bill black.

Iris black.

Head, body, tail, and tarsus blackish, excepting a white band one-half inch wide across rump.

Toes black, the webs with a yellow spot.

These birds are crepuscular near the shore, like *Procellaria nereis*, and much more common near our station after their first appearance on December 8. I had previously seen them at sea east of the Cape of Good Hope; and, on December 14, I saw them out by day feeding on the oily matters floating away from the carcass of a sea-elephant. They frequent rocky parts of the hillsides, and flit about very like swallows in pursuit of insects. There seemed to be no flying insects on the island, however, other than very minute gnats. The two specimens preserved were shot on the evening of December 29, among the rocks near the top of the hill on which we were encamped. I never succeeded in finding the egg, but learn from Rev. Mr. Eaton, who found one on Thumb Mountain, some fifteen miles from our station, that it is single, white, and that the nest was made under a large rock not far from the beach. He found the egg on December 8. I have no doubt from what I have observed of its habits that it nests among and under rocks habitually, and usually at a considerable elevation above the sea.

PROCELLARIA NEREIS, (Gould) Bp.

THE SEA-NYMPH.

Thalassidroma nereis, GOULD, Proc. Zool. Soc. Lond. 1840, p. 178; Ann. Mag. N. H. xiii, p. 367; B. Aust. vii, pl. 64.

Procellaria nereis, BONAPARTE, Cons. Av. ii, 1856, p. 196.

COUES, Proc. Acad. Nat. Sci. Phila. 1864, p. 81.

A large series of this pretty little petrel was collected, the first and only ones I have seen, excepting Gould's types, from Bass's Straits, now in Mus. Acad. Phila., from which the account given in my monograph was drawn up. It is a small and particularly elegant species, quite different from any other known to me; the bluish color recalls birds of the *Prion* group. It comes very near *P. pelagica* proper in form, belonging to the same short-legged group, as distinguished from *Oceanites* and *Fregetta*, though the legs are longer than in *P. pelagica*.—C.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|---------|------|---------|---------|-------|-------|-------|-------|---------|-------------|---------------|----------------|
| 68936 | 44 | Oct. 29 | ♂ | 6.50 | 12.75 | 4.75 | 3.25 | 0.50 | 1.00 | 1.25 | 0.85 | 0.25 | } Skin; pair. |
| 68937 | 45 | Oct. 29 | ♂ | 6.50 | 13.00 | 4.75 | 3.25 | 0.50 | 1.00 | 1.25 | 0.85 | 0.25 | |
| 68935 | 46 | Oct. 31 | ♂ | 6.50 | 12.50 | 4.75 | 3.25 | 0.50 | 1.00 | 1.25 | 0.85 | 0.25 | Skin. |
| 68938 | 47 | Oct. 31 | ♂ | 6.50 | 13.00 | 4.85 | 3.25 | 0.50 | 1.00 | 1.25 | 0.85 | 0.25 | Do. |
| 68940 | 157 | Dec. 15 | ♂ | 6.75 | 12.75 | 4.50 | 3.25 | 0.50 | 0.85 | 1.25 | 0.90 | 0.25 | Skin with egg. |
| 68941 | 158 | Dec. 15 | ♂ | 6.55 | 13.00 | 4.89 | 3.25 | 0.55 | 1.00 | 1.25 | 0.80 | 0.25 | Do. |
| 68934 | 159 | Dec. 15 | ♂ | 6.75 | 13.00 | 4.75 | 3.25 | 0.55 | 1.00 | 1.25 | 0.85 | 0.25 | Skin. |

Bill black; nostrils in separate tube, above base of upper mandible.
Iris black.

Head, body, and tail generally bluish-ashy, except lower part of breast and belly, which are white. Tail very dark at tip, and fan-shaped in flight.

Tarsus, foot, and claws black. Tibia naked 0.50 inch.

Egg single, white, sometimes speckled with reddish at the large end; very large in proportion to the size of the bird.

The first specimens were taken on the 28th and 29th of October, being dug out by the dogs from small burrows under clumps of *Azorella*. A pair captured on the latter date were found under a tussock not two yards above high-water mark, on the beach, under a high cliff. No eggs were found at that date. Eggs were first found, December 12, under the overhanging margins of clumps of grass and "Kerguelen tea" (*Acaena ascendens*), in a bit of swampy lowland near the sea. Strange to say, I have only found the male with the egg. In this locality, there were no burrows; the overhanging herbage seeming to afford sufficient protection to the nests.

This petrel is strictly crepuscular in habit when near its breeding-place; none having been seen by daylight except when disturbed from the nest. I believe its note to be a sort of chirping whistle, not unlike the creaking of a block, but did not succeed in settling this point definitely. No eggs were hatched before our departure from the island. The birds are, at this season, perfect balls of nearly fluid fat.

PSEUDOPRION DESOLATUS, (Gm.) Gray.

"WHALE-BIRD."

Procellaria desolata, GMELIN, Syst. Nat. i, 1788, p. 562.

LATHAM, Ind. Orn. ii, 1790, p. 825. But probably not of authors generally.

Daption desolatum, SHAW, Gen. Zool. xiii, 1825, p. 244.

Æstrelata desolata, COUES, Proc. Acad. Nat. Sci. Phila. 1866, p. 155, in part, with exclusion of much of the synonymy.

Prion (Pseudoprion) desolata, GRAY, Handlist, iii, 1871, p. 108, No. 10923.

Pseudoprion banksii, COUES, Proc. Acad. Nat. Sci. Phila. 1866, p. 166; but whether of the authors there cited?

The single prepared specimen in the collection agrees with the characters I give of *P. banksii*, so that I so identify it with little hesitation. I never identified the *Procellaria desolata* of Gmelin in the least to my satisfaction, having allowed myself to suppose that it was an *Æstrelata*, being unconsciously biased by the fact that it had been very generally so considered by writers. In attentively re-examining Gmelin's diagnosis, with reference to the specimen in hand, I find, to my surprise, that it agrees in essential points with the bird brought in by Dr. Kidder, and I am forced to the conclusion that Gray is right in referring it to my section *Pseudoprion*. It will be observed

that in my monograph I did not identify Gmelin's name, merely quoting his description, and adding to it a description of Schlegel's from the same specimen that Kuhl handled; both these authors having considered it the same as Gmelin's bird. It would appear, however, that such is not the case, especially as we have Kantschatka assigned as a locality.

The bird here treated is *Pseudoprion banksii* of my paper, but whether the *banksii* of authors I am now uncertain. It is also, I have now no doubt, the original *P. desolata* of Gmelin, as correctly allocated by Gray, and, consequently, in part the *Æstelata desolata* of my paper, but is apparently not the *desolata* of late authors.

The expressions used by Gmelin in reference to the dark band running clear across the body and wings, and the dark tip to the tail, point to a *Prion*, not to one of the *Æstelata*.—C.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Foot. | Middle claw. | Remarks. |
|---------------------------------|------------------|------------------|-------|---------|---------|-------|-------|-------|-------|---------|-------|--------------|----------|
| 6:926 | 100 | 1874. Nov. 24 | ♂ | 10.50 | 23.35 | 7.25 | 3.85 | 1.15 | 1.60 | 1.25 | 1.25 | 0.25 | Skin. |
| ..... | 137 | Dec. 10 | ..... | 11.25 | 24.00 | 7.15 | 4.00 | 1.15 | 1.50 | 1.25 | 1.25 | 0.25 | Alcohol. |
| ..... | 138 | Dec. 10 | ..... | 11.30 | 24.10 | 7.50 | 4.00 | 1.25 | 1.60 | 1.25 | 1.25 | 0.25 | Do. |
| ..... | 170 | Dec. 16 | ..... | 10.75 | 24.25 | 7.75 | 4.00 | 1.15 | 1.50 | 1.30 | 1.25 | 0.35 | Do. |
| ..... | 171 | Dec. 16 | ..... | 10.75 | 24.15 | 7.25 | 3.75 | 1.20 | 1.60 | 1.35 | 1.50 | 0.25 | Do. |

Bill lavender-blue, widened at base; upper mandible sharply hooked.

Nostrils similar to those of *Halobæna cærulea*, but more distinctly separated.

Iris invisible during life, bluish-gray.

Head blue-gray above; white line above eye; blue line from posterior angle of eye to join the tint at the back of the head; throat and region around base of bill white.

Body generally paler than that of *Halobæna cærulea*, but marked by a dark band running from wrist-joint along radial portion of wing to and across rump. This band becomes very distinct, when the bird is flying, as a ∇ -shaped marking.

Tarsus and *foot* lilac-blue; claw black at tip, lilac or white at base; middle claw turns sharply outward.

Tail marked by a black band of one-half inch at the tip.

This bird was at first confounded by me with *Halobæna cærulea*, which, in life, it greatly resembles. It was much less common at our station than *Halobæna*, none being observed until November 24; is smaller, much more pugnacious, and distinguished, on superficial examination, by the dark band at the tips of the tail-feathers; *Halobæna* showing a white band in the same part. The beak, tarsus, and foot also are lavender-blue in *Pseudoprion*, but black in *Halobæna*.

Pseudoprion burrows near the sea-shore, in lowland, under stones, or

[illegible]

Bill black; upper mandible sharply hooked, lower much flattened at its base.

Nostrils tubular, divided by a septum, looking upward and placed far back on the bill.

Iris very dark-brown or black; not visible during life.

Head slaty-blue on top and at back, shading into paler slate-color at the sides. Throat and parts around insertion of bill white, the slate-tint nearly meeting, from each side, under the throat.

Breast, belly, and under parts of wings and tail white; upper surface slaty-blue, shading into very dark tint; mottled with brown along primaries, secondaries, and tertiaries. Narrow white band, of one-half inch, at extremity of tail. The dark tint above mentioned runs from the carpal joint of either wing downward to the rump, making, when the bird is flying, a V-shaped marking, not so distinct, however, in this species as in *Pseudoprion*.

Tarsus and *foot* black and scutellated (excepting No. 41, a very pale specimen, taken with the egg, in which they were noted as pearl-gray).

Claws black, the middle claw being turned sharply outward.

Upon first landing (September 13), the hill-sides, apparently quite deserted during the day, became at night perfectly alive with these birds and a species of *Pelceanoides* (*P. urinatrix*, Gm.), flying irregularly about the rocks and hummocks of *Azorella*, and filling the air with their call. The note much resembles the cooing of pigeons, consisting of three short notes repeated in rapid succession and followed by two long ones, thus: "kūk-kūk-kūk—cōō-cōō." They seemed rarely to fly over the water, but to confine themselves to the neighborhood of their burrows, sometimes alighting and again taking wing—very much as if there were legions of bats inhabiting the hill. I never succeeded in satisfying myself as to the object of this constant flight during the night, although I spent much time in watching them, since, so far as my observation extended, there were no night-flying insects whatever upon the island, nor did the structure of the stomachs of these birds seem fitted to an insect diet.

The burrows are excavated beneath the mounds of an umbelliferous plant, which abounds on the Kerguelen hill-side (*Azorella selago*, Hook. fil.), growing in dense masses of often several feet in diameter. The holes usually run straight inward for a foot or more, then turn sharply to the right or left, parallel with the hill-side, thence downward, often doubling once or twice upon themselves and communicating with other

entrances. At the bottom is an enlarged cavity, lined with fine root-fibers, twigs, ferns, or leaves of the "Kerguelen tea" (*Acena affinis*, Hook. fil.), and quite dry. Here the single egg is to be found, always quite covered with dry powdered earth or the leaves above mentioned. The diameter of the burrows at their entrance is about that of a man's wrist. Limpet and mussel shells were often found near by. Upon our first arrival, two birds, male and female, were usually found in each burrow during the day. After they began to lay, however, but a single one was to be found with the egg, usually, but not always, the female.

When set free in the day-time, the mode of flight was irregular, as if the light were confusing to the bird. They always alighted in the water after flying a mile or so. The noise of their calling was incessant during the night, coming quite as often from the burrows as from the air, but became much less frequent after the middle of November, from which I infer that the call is connected with the season of pairing.

The egg is white, single, and measures 1.90-2.00 by 1.45-1.55 inches. They had probably begun to pair by the time of our arrival (September 13), and the first egg was found October 23, although doubtless they begin to lay earlier. A young bird, covered with slate-colored down, was found November 12, and frequently thereafter.

The traveler who should visit Kerguelen Island only during the day, returning to his ship every night, might easily fail to observe the presence of these birds at all, since, in the neighborhood of their burrows, they are exclusively nocturnal in their habits, being perhaps the very latest to appear after night-fall. They are, however, often seen at sea during the day, many hundreds of miles from land.

PELECANOIDES URINATRIX, (Gm.) Lacép.

"DIVER" and "———" of the whalers.

Procellaria urinatrix, GMELIN, Syst. Nat. i, 1788, p. 560.

Pelecanoides urinatrix, "LACÉP.", GRAY, G. of B. iii, 1849, p. 646.

COUES, Proc. Acad. Nat. Sci. Phila. 1866, p. 190.

Halodroma urinatrix, ILLIGER, Prod. 1811, p. 274.

BONAPARTE, Consp. Av. ii, 1856, p. 206.

SCHLEGEL, M. P.-B. 1863, p. 37.

Puffinuria urinatrix, GOULD, B. Aust. vii, pl. 60.

Puffinuria garnoti, LESSON, Voy. Coquille, 1826, pl. 46; Man. Orn. ii, 1828, p. 394; Tr. Orn. 1831, p. 730.

Pelecanoides garnoti, GRAY, G. of B. iii, 1849, p. 646.

Halodroma garnoti, SCHLEGEL, M. P.-B. 1863, p. 37.

Procellaria tridactyla, FORST., Deser. An., ed. Licht. 1844, p. —.

As very strongly intimated in my paper, satisfactory diagnosis of the three currently-reported species of this genus is wanting. Nor is my faith in their distinctness increased

on finding that these specimens, which from the locality undoubtedly represent the original *P. urinatrix*, are fully up to the dimensions of the supposed larger *garnoti*, from the west coast of South America. Observed variation in the color of the feet, which is one point that has been relied upon, lessens the probability of distinctness, especially as the ascribed coloration does not coincide in every case with the dimensions. The size and proportions of the examples examined, as carefully measured in the flesh by Dr. Kidder, warrant me in adding the *garnoti* of Lesson as a synonym of *urinatrix*; to which I still refrain, however, from adding the *berardi* of Quoy and Gaimard.—C.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|-------------------|-------|---------|---------|-------|-------|-------|-------|---------|-------------|---------------|--|
| 68929 | 2 | 1874. Sept. 19 | ♂ | 8.50 | 14.00 | ..... | ..... | 0.85 | ..... | ..... | ..... | ..... | Skin. |
| 68930 | 3 | Sept. 19 | ♂ | 9.90 | 14.00 | ..... | ..... | 0.75 | ..... | ..... | ..... | ..... | Do. |
| ..... | 4 | Sept. 19 | ♂ | 8.50 | 14.25 | ..... | ..... | 0.75 | ..... | ..... | ..... | ..... | Do. |
| 68931 | 59 | Nov. 9 | ♂ | 7.00 | 13.00 | 4.85 | 2.25 | 0.75 | 1.60 | 1.05 | 1.05 | 0.30 | Skin; ovaries much enlarged; 2 ovules nearly ripe. |
| 68927 | 60 | Nov. 9 | ♂ | 7.15 | 13.00 | 4.95 | 2.40 | 0.75 | 1.50 | 1.00 | 1.20 | 0.25 | Skin; testicles enormous, as large as sugared almonds. |
| 68928 | 101 | Nov. 24 | ♂ | 7.60 | 16.00 | 4.75 | 1.95 | 0.75 | 1.50 | 1.05 | 1.00 | 0.25 | Do. |
| ..... | 140 | Dec. 10 | ..... | 9.00 | 16.35 | 4.75 | 2.05 | 0.80 | 1.50 | 1.00 | 1.05 | 0.25 | Alcohol. |
| ..... | 148 | Dec. 11 | ..... | 2.25 | 15.75 | 4.85 | 2.10 | 0.85 | ..... | 1.10 | 1.05 | ..... | Do. |
| ..... | 172 | Dec. 23 | ..... | 8.00 | 16.00 | 5.00 | 1.75 | ..... | 1.35 | 1.00 | 1.10 | 0.20 | Do. |
| ..... | 173 | Dec. 23 | ..... | 8.00 | 16.00 | 4.85 | 1.75 | 0.75 | 1.35 | 1.05 | 1.10 | 0.25 | Do. |
| ..... | 174 | Dec. 23 | ..... | 8.00 | 16.25 | 5.00 | 1.85 | 0.75 | 1.35 | 1.00 | 1.10 | 0.25 | Do. |
| ..... | 175 | Dec. 23 | ..... | 8.00 | 16.00 | 4.75 | 1.80 | 0.75 | 1.35 | 1.05 | 1.05 | 0.25 | Do. |

Bill generally black; lavender-blue at quadrate basal portion of lower mandible. Upper mandible hooked; both much compressed and flattened; square at base. Nostrils placed far back, opening upward by a heart-shaped aperture, divided by a longitudinal partition, as if the upper half of a tubular inclosure had been cut off, parallel to its long axis.

Iris ash-colored; not visible during life, when only the black pupil appears.

Head blue-black above; throat white.

Body, upper parts blue-black; throat, breast, belly, and under part of tail white. Under down yarn-blue. Skin of belly naked. Plumage very fine and close. The body is remarkably large and heavy in proportion to the length of the wing; the latter being concave, similar to that of the quail. First and second primaries equal in length.

Tarsus and *foot* are placed very far back, nearly in the axis of the body; lavender-blue; not scutellated; no rudiment of hind toe.

Claws black; middle claw turned outward.

Tail very short, black above, white below.

When the Swatara was endeavoring to land a party at Possession Island, the largest of the Crozet group, early in September, I noticed frequently a very small diver, which took wing immediately on arising to the surface of the water, and after a short flight dived beneath it without first alighting. I suppose this to have been the bird now under consideration, although, as will be seen, I failed to verify the fact absolutely. On the first landing of our party at Kerguelen Island, this bird was one of the two most commonly heard at night, and seen fluttering about the hillside. Its note is somewhat similar to the mew of a cat, with a marked rising inflection of sound. It cannot rise from level ground in flight, but, once in the air, flies strongly and rapidly, with a rapidly fluttering motion of the wings, very like the flight of the common English sparrow. It burrows in the same localities as *Halobana*, digging less deeply and making fewer turns in its burrow, and seems to remain therein during the day, being exclusively nocturnal in its habits when near its nest. Lays one egg, as large as a pigeon's, white, and not sharply pointed; first found by me December 10. I did not succeed in finding any young up to January 10, the date of our departure.

I heard much from the whalers and others of the great diving powers of these birds, which their structure certainly seems to indicate, without being able to confirm the fact by personal observation. On the night of November 23, while I was watching by the sea-shore the actions of the birds flitting across the path of the moon's light upon the water, with the purpose of settling this point, one flew close by my ear, with a great whirring of wings, from the sea and into the bank behind me. It could not rise again on the wing, and I captured it, with some difficulty, owing to the darkness, as it was making its way back to the water. I tied a long, light string to one of its legs, carried it out some yards on a plank-walk leading to the tide-gauge, and threw it into the sea. It swam well, and could rise from the water in flight, spattering for a long way with its wings, like a duck; but made no attempt whatever to dive, although much frightened and restrained from flight by the string. The experiment was repeated several times with no better success. (Specimen preserved, No. 101.) The stomachs of all the specimens examined were found to be empty, and I have no clue therefore from the nature of their food.

There seems to be no reasonable doubt of the diving powers of *Pelecanoides*, however, or that it habitually seeks its food in that way, not-

withstanding its failure to exhibit in my presence when absolute identification was possible.

NOTE 1.—The Cape Pigeon (*Daption capensis*) and Yellow-billed Albatross (*Diomedea culminata*?) have also been seen now and then near the shore, but were not found breeding by our party. The former appeared on the evening of December 8, near our camp; and I saw it again January 2, flying to sea from inland, near Prince of Wales Foreland. The latter was common along the coast, and occasionally seen in Royal Sound.

NOTE 2.—Alcoholic specimens of an undetermined *Puffinus* are in the collection, but have not been examined by Dr. Coues.

APTENODYTES LONGIROSTRIS, Scop.

KING PENGUIN.

Patagonian Penguin, PENNANT, Phil. Trans. lviii, 1768, p. 91, pl. 5, in part.

Aptenodytes patagonica, GMELIN, Syst. Nat. i, 1788, p. 556, in part.

LATHAM, Ind. Orn. ii, 1790, p. 878, in part.

Pinguinaria patagonica, SHAW, Nat. Misc. xi, 1797, pl. 409 (nec Forst.).

Aptenodytes longirostris, SCOPOLI, Sonn. Voy. p. 180, pl. 113.

COUES, Proc. Acad. Nat. Sci. Phila. 1872, p. 193, pl. 5, figs. 5-8 (osteology).

Aptenodytes pennantii, GRAY, Ann. Nat. Hist. 1844, 315, and of most subsequent authors.

Spheniscus pennantii, SCHLEGEL, M. P.-B. Urin. 1866, 3; De Dier. p. 268, fig. —.

Aptenodytes rex, Br., apud Gray.

—C.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|------------------|------|---------|---------|-------|-------|-------|-------|---------|-------------|---------------|-------------|
| ..... | 104 | 1874. Nov. 26 | ♂ | 36.00 | 31.50 | 12.50 | ..... | 2.75 | ..... | 1.65 | 3.15 | 1.15 | Skin; lost. |
| ..... | 230 | 1875. Jan. 4 | ♂ | 45.50 | 35.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Skin. |
| ..... | 231 | Jan. 4 | ♀ | 39.50 | 32.50 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Do. |

The "wing"-measurement is the length of entire flipper.

Bill pointed and narrow; upper mandible black; nostrils opening in slits which extend nearly its whole length. Lower mandible black anteriorly, flesh-colored over posterior half, as if covered with mucous membrane.

Iris bright-brown.

Head black. Yellow collar from front of throat upward to behind eye, narrow at side of neck, pyriform above. Throat black.

Body generally black; breast and belly white. Feathers small, pointed, and spike-shaped.

Tarsus and *foot* black. Tarsus very short. Foot three-toed, webbed, and very stout, resembling the foot of a plantigrade animal. Large callosity under heel, upon which and the point of the tail the bird balances itself in standing, the toes not touching the ground.

Claws black.

Tail a bunch of bristles, compressed from side to side.

Tibiae are very long, and the skin covered internally by a very thick layer of fat. The superficial muscles have numerous and broad attachments to the skin internally.

The first specimens of this penguin found near our station were met with on the beach on November 26, having apparently just come out of the water. There was but a single pair, both of which were secured, one being brought home alive. The other fought so fiercely that I had to kill him to get him home. Captain Fuller, of one of the sealing-schooners, informed me that skins taken at that time would be worthless, as the birds were beginning to moult. I skinned but one of the birds, therefore, and endeavored to keep the other alive, tying it up on the beach with a good long line to its leg. It had received a pretty severe blow on the head while being captured, which may account for a good deal of dullness during the first week or so, and for a strong aversion to the water which it showed at first. After a time, it brightened up, and would spend a large part of every day at the end of its line, splashing in the water. It finally entangled itself in the sea-weed near the bottom, and was drowned during the night (December 16). It slept bolt upright, balanced on its heels, swaying back and forth as it breathed, and snoring heavily. The neck is very extensible, so much so that the bird can stand at least a foot taller when excited than when at rest. It will frequently remain for twelve hours standing in the same place, and seems to me to be in every way a stupider bird than either *Pygoscelis* or *Eudyptes*. When thrown down, it raises itself by aid of its beak, pressing the point against a stone.

December 29, two more were captured on the beach at the other side of the point upon which we had settled. Mr. Holmes and I brought them alive across the top of the hill, and found it a very laborious undertaking. I tried to drive my bird; but a very short journey on an up-grade entirely exhausted his breath. After two or three attempts, he turned about, having made up his mind to fight it out to the last rather than

try any further. These penguins are much less active on land than other species.

One was found on the coast, several miles away, on January 2, but I saw no eggs or nests. Captain Fuller, of the schooner Roswell King, informs me that they do breed upon the eastern side of the island, on the lowland, but that they build no nests whatever, carrying the egg about in a pouch between the legs, and only laying it down for the purpose of changing it from male to female. I have questioned Captain Fuller again upon this subject since my return from the expedition, and he asserts that he has verified the fact repeatedly from personal observation. The pouch, if there is one, can be no more than a fold of the skin, since none was noticed in skinning or measuring the specimens. The same story has been told of other penguins (see *Pygoscelis*). I can only say that I have always found Captain Fuller's statements in other matters to be reliable, and look upon him as an unusually careful observer, but can add no evidence of my own in this case.

PYGOSCELIS TÆNIATA, (*Peale*) *Coues*.

"JOHNNY" of sealers and whalers.

Aptenodytes papua, FORSTER, Comm. Soc. Reg. Gött. iii, 1781, p. 140, pl. 3. (Nomen ineptum.)

BONNATERRE, Ency. Méth. i, 1782, p. 67, pl. 17, f. 3.

GMELIN, Syst. Nat. i, 1788, p. 556.

LATHAM, Ind. Orn. ii, 1790, p. 879.

VIEILLOT, Gal. Ois. pl. 299.

GRAY, Voy. Erebus and Terror, pl. 25.

Eudypetes papua, CASSIN, Orn. U. S. Expl. Exped. 1858, p. 264.

GOULD, Proc. Zool. Soc. 1839, p. 98.

Spheniscus papua, SCHLEGEL, Mus. Pays-Bas, iii, 1866, p. 5.

Pygoscelis papua, HYATT, Proc. Bost. Soc. N. H. 1871, p. —.

Aptenodytes tæniata, PEALE, U. S. Expl. Exped. 1848, p. 264.

Pygoscelis tæniata, COUES, Proc. Acad. Nat. Sci. Phila. 1872, p. 195.

Pygoscelis wagleri, SCLATER, P. Z. S. 1860, p. 392.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|------------------|------|---------|---------|-------|-------|-------|-------|---------|-------------|---------------|--|
| ..... | 208 | 1874. Dec. 30 | ♀ | 30.50 | 21.50 | 10.00 | 5.60 | 2.85 | 3.50 | 1.00 | 2.60 | 1.05 | Skin; packed in salt. Skin; sex not recorded; packed in salt. |
| ..... | 224 | 1875. Jan. 4 | ... | 29.50 | 22.25 | 9.25 | 6.50 | 3.25 | ..... | 1.25 | 2.35 | 1.00 | |
| ..... | 225 | Jan. 4 | ... | 29.50 | 24.00 | 10.00 | 6.85 | 3.15 | 4.10 | 1.25 | 2.35 | 0.85 | |

Bill, lower mandible and lower margin of upper mandible brilliant-orange; upper portion and tip of upper mandible black.

Nostrils opening by slits at sides of bill, 1.25 inches from its tip. Bill, as a whole, long, narrow, and pointed.

Head black, excepting an irregularly dumb-bell-shaped white band from eye to eye; the narrowest part of the marking being at the back and top of the head.

Iris rich-brown. Pupil lozenge-shaped when contracted.

Body, belly, breast, and underside of flippers white, the remainder of the body being black. The scales on the flippers are more evidently rudimentary feathers than in other penguins, the lowermost row being tipped with white. The feathers generally are small, pointed, and without distinct blade, similar to "pin-feathers".

Tail compressed from side to side, formed of very stiff quills, and disposed like the canvas of a tent, the ridge looking upward.

Tarsus and *foot* orange-colored, scutellated.

Claws black. Distinct rudimentary hind toe.

On the arrival of the *Swatara* at Kerguelen, these birds had already begun to lay, and we had their eggs for breakfast on the morning of September 10, finding them quite free from any fishy flavor, and, although rather insipid, a very acceptable change from sea-diet. The fact that when cooked the albuminous portion only partially coagulates renders them less inviting in appearance than other eggs; and, probably on this account, the custom is to serve only the yolks. Two or three of the birds were captured by the boat's crew which went on shore after the eggs, and brought back to the ship, where they created a good deal of amusement. When walking away from the spectator, swaying from side to side, with flippers hanging well away from the body, they bear a ridiculous resemblance to small children just beginning to walk who have put on overcoats much too long for them. A rookery was found about two miles from our station, which I visited September 16, finding many eggs. It is established upon the seaward extremity of a high rocky ridge, running nearly parallel with the trend of the shore, and abutting upon the sea in lofty bluffs. At the foot of this ridge is a little rocky cove, where the penguins land, and beyond the coast becomes precipitous, the rocks rising perpendicularly some hundred or more feet. Up the very steep inland slope of this hill, thickly overgrown with the "Kerguelen cabbage"* and "tea",† the penguins have to climb, after

* *Pringlea antiscorbutica*.

† *Acacia affinis*.

crossing a considerable upland meadow. Numerous very distinct paths have been worn by successive generations of penguins, until the defiles cut in the sod near the sea are, in some cases, as much as four feet in depth. The track to a penguin-rookery and their landing-place are always marked by a remarkably luxuriant growth of a plant with long feathery fronds, belonging to the order *Compositæ*.* The tracks followed the course of a small stream in this instance, and ascended pretty sharp acclivities, steep enough to try one's wind in following them up, until a level plateau was reached on top of the hill. The eggs (which were here never more than one to a nest) were laid either in hollows between the mounds of *Azorella* which covered the plateau, or in little bare spots scratched on their tops. I did not succeed in verifying the statement, constantly re-affirmed by whalers and sealers, that the female takes up her egg again into the oviduct, when disturbed, and carries it off; but I have seen a female, disturbed from the nest, drop her egg again at some yards' distance when waddling off. I should suppose it more probable that she carried it between the thighs (tibiæ), the structure of which makes such a proceeding quite possible. This particular rookery had been long known to the sealers, who make their rendezvous some ten miles distant, at Three Island Harbor, and who had already robbed the nests when we arrived; consequently, the birds had constantly been driven higher up the hill and farther inland, until, at the time of our coming, they were found nesting fully half a mile from their landing-place, and at an elevation of about three hundred feet. The eggs resemble in size and shape those of a duck, being, as a rule, rather larger. The brood from which my specimens were collected must have been at least the ninth or tenth laying since the season commenced. At other and more distant rookeries, subsequently visited, where the birds had not been so often disturbed, they were found to lay nearer the coast, and, as a rule, two young were found to each old bird. Singularly enough, one of these was always well-grown, apparently from one to two months old, while the other had just been hatched or was still in the egg. It must, consequently, be the practice of these birds to rear two broods in a season, keeping both in the nest at the same time. No other birds lay among or near them; and it seems quite impossible that the albatross should do so in any locality, as has been made evident in describing the nest of that bird.

Perhaps one hundred and fifty individuals were to be seen at a time

* *Leptoclella plumosa*.

at the rookery near us, standing gravely together for hours and doing nothing, as is their custom; but a small proportion being nesting females. Probably half as many more, in companies of twenty or so, were laboriously toiling up the steep paths from the sea. So long and difficult a journey seems strange enough, undertaken by birds so slow of locomotion as penguins. But members of this species at least are by no means slow in getting over the ground, and, although they do not unfrequently fall upon their bellies, they are prompt in picking themselves up again, and seem to look upon such falls as a natural part of their progress. They do not at all find it necessary to drag themselves up a gentle slope on their bellies by the aid of flipper and beak, as has been stated.

No living thing that I ever saw expresses so graphically a state of *hurry* as a penguin when trying to escape. Its neck is stretched out, flippers whirring like the sails of a wind-mill, and body wagging from side to side, as its short legs make stumbling and frantic efforts to get over the ground. There is such an expression of anxiety written all over the bird; it picks itself up from every fall and stumbles again with such an air of having an armful of bundles, that it escapes capture quite as often by the laughter of the pursuer as by its own really considerable speed.

On the 3d of December, near the landing-cove already mentioned, about the time of hatching, I observed a school of these penguins progressing by leaps clear of the water; one following another in so rapid succession that two or three were always in the air, and with a motion so like that of a school of porpoises, that I at first took them for those marine mammals. In the water, indeed, all awkwardness at once disappears; their speed in swimming being almost incredible, and surpassing, of course, that of the fish upon which they feed.

December 4, I found one young penguin just hatched and three more still in the eggs, which they had broken with their beaks. As already stated, however, this rookery was very much behind time, and I know of a young penguin having been captured as early as October 12. The young were covered with soft, hairy, pearl-gray down. Head black above and behind; bill flesh-colored; feet black on the soles and flesh-colored above. (Original numbers 119, 120, 121, and 122.)

EUDYPTES CHRYSOLOPIA ? *Brandt.*

ROCK-HOPPER.

? *Eudyptes chrysolopha*, BRANDT, Bull. Acad. St. Pétersb. ii, 324.

SCHLEGEL, M. P.-B. Urin., p. 7.

COUES, Proc. Acad. Nat. Sci. Phila. 1872, p. 204.

The specimens collected by Dr. Kidder seem to agree better with *chrysolopha* than with *chrysocome*, in the lighter and more bluish shade of the upper parts, weaker bill and general elongation of the coronal feathers; although the yellow plumes on each side of the head are neither so long nor so brightly colored as in the Philadelphia Academy's specimen, upon which my actual knowledge of *chrysolopha* rests. I am still of opinion that difficulty will be found in establishing the supposed species upon a satisfactory basis.—C.

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Flipper. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|------------------|-------|---------|---------|----------|-------|-------|-------|---------|-------------|---------------|--------------------------|
| ..... | 50 | 1874. Nov. 1 | ♂ | 22.00 | 16.00 | 3.50 | 5.00 | 2.00 | 3.00 | 1.15 | 2.00 | ..... | Skin; afterward lost. |
| ..... | 51 | Nov. 1 | ♂ | 23.00 | 18.00 | 3.75 | ..... | ..... | ..... | ..... | ..... | ..... | Do. |
| ..... | 186 | Dec. 23 | ♀ | 23.85 | 15.50 | *6.50 | 6.00 | 2.00 | 2.75 | 0.85 | 2.15 | 0.75 | Skin; preserved in salt. |
| ..... | 202 | Dec. 27 1875. | ♀ | 23.00 | 16.00 | *6.50 | 5.25 | 1.75 | 2.85 | 1.00 | 2.60 | 0.75 | Do. |
| ..... | 223 | Jan. 4 | ♀ | 23.00 | 16.00 | *6.50 | 5.25 | 1.75 | 2.80 | 1.00 | 2.65 | 0.75 | Do. |
| ..... | 226 | Jan. 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Skin; not measured. |
| ..... | 227 | Jan. 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Do. |
| ..... | 228 | Jan. 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Do. |
| ..... | 229 | Jan. 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Do. |

* Whole length of flipper.

Bill conical, orange. Nostrils not apparent.

Iris deep-pink.

Head black; crested by a broad horizontal layer of feathers, directed backward, and radiating from insertion. The marginal plumes, lying just above each eye, are mustard-yellow, those in the center being black. Tongue strong and pointed, furnished with five longitudinal rows of teeth, the palate being supplied with four.

Body, throat and belly white; nape and back blackish; the dividing line between the colors running through the insertion of the flippers.

Tail spike-shaped, flattened from side to side.

Tarsus short and stout; "skin" white. Foot same color; three toes palmate; hallux rudimentary, black on plantar surface.

Eggs two, white; one generally larger than the other.

These brave little penguins had established a large rookery not more than two miles from our station, where I found them nesting on the 7th of December. They had begun to appear along the coast early in November; two of them having been captured and skinned on the 1st of that month. Probably, they begin to lay about the first of December. The rookery above mentioned was established among the loose rocks, from the crevices of which a coarse grass (*Festuca*) grew abundantly, just where the *débris* from the precipice above makes a sort of steep "lean-to" against its side, and sloping sharply into the sea. The nests are rather more distinct than those of *Pygoscelis*, and most of them were lined with dried grass. Each contained two white eggs, of which one was usually larger than the other; and both birds were, as a rule, by each nest. Whether one hunts to feed the other or not, I cannot say. A small flock came in from sea while I was present, announcing their arrival by a single shrill whistle, frequently repeated, and answered from the shore. They were wonderfully courageous, erecting their sulphur-colored plumes, and trembling all over with excitement on my approach, while they kept up a strident cackling that was almost deafening. Although knocked off their nests and down over the steep rocks for often twelve or fifteen feet, they would pick themselves up and scramble back again with unabated courage, threatening, and even biting sharply, to the very last. I suppose that the thick layer of fat beneath the skin, particularly abundant in this species at this time, serves as a protection against the hard knocks which they frequently get in falling from the rocks; no ordinary fall seeming to have the least effect upon them. They seem to dread far more the attacks of their neighbors, which harry them from almost every crevice as soon as they leave their own proper nest. The whaler's epithet "rock-hopper" is in this case particularly well applied, since they are the most agile of all penguins, skipping from rock to rock, climbing very steep inclined surfaces, and getting over the ground with great speed. It is worthy of notice that these penguins always *hop*, using both feet at a time like a sparrow, and never walk, as do other genera. Cormorants and *Chionis* were their nearest and most friendly neighbors, particularly the latter. As soon as one is knocked off its nest, its mate immediately covers the egg, showing the same anxiety and courage. No eggs had been hatched so late as January 4, the date of my last visit to the rookery.

The apparent widening of the cheeks, caused by the erectile plumes and the position of the feathers below them, with the plumes themselves,

looking not unlike "whiskers" on a front view, have given rise to the name "sea-cats", occasionally applied to these birds.

On January 19, being then at sea, in latitude $39^{\circ} 28'$ south, longitude $64^{\circ} 33'$ east, and fully six hundred miles from the nearest land, a small penguin, supposed then to be one of this species in poor plumage, was observed following the ship. It seemed to mistake the ship (Moaonga-hela) for an island, and swam around it nearly all day, trying to find a landing-place, the wind being light, and the ship going from two and a half to three knots through the water. We had thus an excellent opportunity to observe from above the penguin's manner and great facility in swimming. It always dives when intending to swim with speed, and uses its flippers with great effect, looking precisely like a fish—a small shark, perhaps. It had not the slightest difficulty in keeping up with us.

EUDYPTES DIADEMATUS, *Gould.*

"MACCARONI."

Eudyptes diadematus, GOULD, Proc. Zool. Soc. 1860, p. 419.

SCHLEGEL, *Univ. M. P.-B.*, ix livr. 1866, p. 8.

COUES, Proc. Acad. Nat. Sci. Phila. 1872, p. 206.

A fragment of skin, from a characteristic spot (top of the head), enables me to identify the species as an inhabitant of Kerguelen's Land.—C.

These penguins nest upon Kerguelen Island, as I am informed, but not upon that part selected by our party as an observing-station; nor have I any other specimens than a *scalp*, brought me as a present from Heard's Island by one of the elephant-sealers. It appears, however, that they do not differ materially in habits from *E. chrysolopha*, choosing the same localities for nesting, and progressing by the same hopping gait.

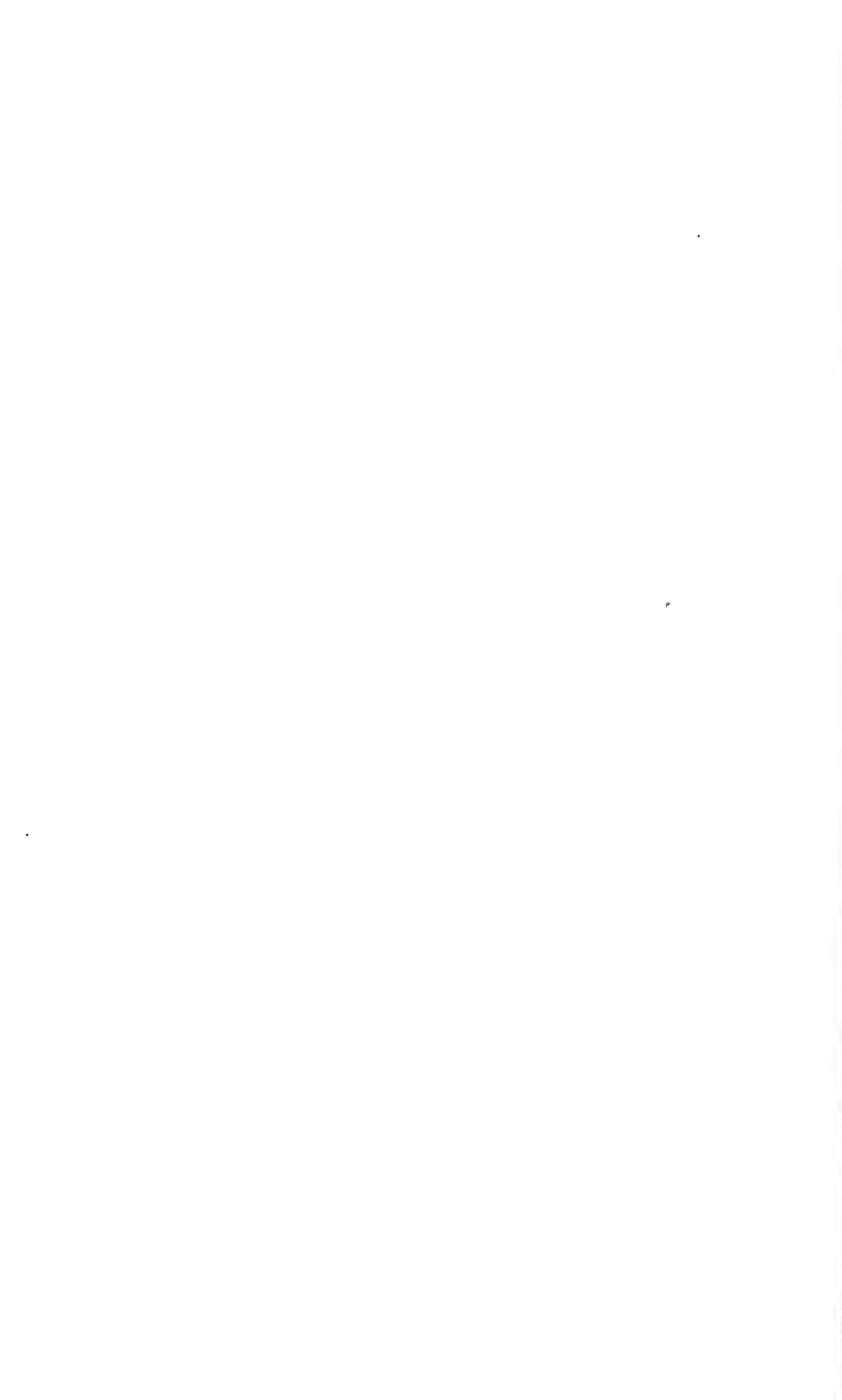


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OF THE

UNITED STATES NATIONAL MUSEUM.

No. 3.

PUBLISHED UNDER THE DIRECTION OF THE SMITHSONIAN INSTITUTION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

ADVERTISEMENT.

This work is the third of a series of papers intended to illustrate the collections of Natural History and Ethnology belonging to the United States and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

JOSEPH HENRY,

Secretary Smithsonian Institution.

SMITHSONIAN INSTITUTION,

Washington, February, 1876.

CONTRIBUTIONS
TO THE
NATURAL HISTORY
OF
KERGUELEN ISLAND,

MADE IN CONNECTION WITH THE UNITED STATES TRANSIT-OF-VENUS
EXPEDITION, 1874-75.

BY
J. H. KIDDER, M. D.,

PASSED ASSISTANT SURGEON U. S. NAVY.

II.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

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PREFACE.

This bulletin embodies the results of an examination of the eggs contained in my collection, the identification of the plants by the various specialists to whom they had been sent and the determinations of the remainder of the zoölogical collections from Kerguelen Island. The appendix contains a brief description of the collections of Surg. E. Kersbner, U. S. N., in the Chatham and Auckland Islands and in New Zealand; and of Mr. I. Russell, in New Zealand.

The unknown young bird, supposed to be a *Puffinus* (Bull. No. 2, pp. 26 and 27), proves to belong to *Æstrelata lessoni*; and many of the eggs, being new to museums, present points of greater or less scientific interest.

The botany of Kerguelen Island had already, as is well known, been very thoroughly studied by Dr. J. D. Hooker, in connection with Sir James Clarke Ross' Antarctic Expedition (1839-'41). His great monograph upon this branch of natural history, the *Flora Antarctica*, has left little for the botanical collector to do in that field, and, magnificently illustrated as it is, was of constant service to me while on the island. But seventeen flowering-plants are included in the collection, belonging to eleven natural orders; four of these being grasses. Three varieties of *Ranunculus* are added to Dr. Hooker's list, while two Phænogams attributed by him to the locality (a *Juncus* and *Limosella aquatica*) were not found. Since, however, this distinguished observer did not have an opportunity of visiting the island during the season of flowering, many of these specimens have their weight in determining points which still remained doubtful in his mind; notably with regard to *Lyallia Kerguelensis*.

Other plants not heretofore attributed to this locality are: *Polypodium vulgare*, *P. (Grammitis) australe*, and *Cistopteris fragilis*, among Ferns; *Grimmia frondosa* (new species) and *G. kidderi* (new species), among Mosses; *D'Urvillea harveyi*, *Rhodomela gaimardi*, *Calothrix-nion ptilotæ*, and *Codium adhaerens*, among Sea Weeds; and *Pannaria taylori*, *P. glau-cella*, *Placodium bicolor*, and *Urecolina* (new genus) *kerguelensis* among Lichens.

The zoölogical collections, although comparatively small, contain an unusual number of new genera and species, notably in molluscs, insects, crustaceans, and echinoderms. Descriptions of these have been furnished by Profs. Verrill, S. I. Smith, Dall, Hagen, and Osten-Sacken, and will be found under the appropriate headings. Thanks are due to these gentlemen and to others whose co-operation has added much to the scientific value of this report.

The Bulletin concludes with a study of *Chionis minor*, an unique and little-known bird, with an attempt to establish its proper position in classification.

J. H. K.

SMITHSONIAN INSTITUTION,

Washington, D. C., November 1875.

OÖLOGY, ETC.

BY J. H. KIDDER AND ELLIOTT COUES.

CHIONIS MINOR, *Hartl.* (p. 1.)*

Lays two or three eggs, differing much in color (*auct.* Rev. A. E. Eaton), about January 10, in the crevices formed by fallen rocks. The nest is made of grass-stems (*auct.* Capt. J. J. Fuller, not seen by J. H. K.). But a single specimen was preserved, given by the Rev. Mr. Eaton, and this was badly broken, but has been mended upon a plaster model. The specimen is regularly oval in shape, like a rather small and narrow hen's egg. Seen under a lens, the outermost calcareous layer appears to be deposited in an irregular net-work, upon a substratum of dark slate-color. The shell is thick and of coarse texture. The superficial markings include several shades of dark sepia-brown, disposed in irregular blotches, but arranged, for the most part, longitudinally. These blotches are more plentiful and closely aggregated about the thickest part of the egg than at either end, and overlie a general *café au lait* tint, which proves, under the lens, to be due to the appearance of the dark substratum above mentioned, through the minute areolation of the outer calcareous layer. The measurements are as follows:—

| Smithson. No. | Orig. No. | Measurements. |
|---------------|-----------|---------------|
| | 245 | 2.28 × 1.48 |

QUERQUEDULA EATONI, *Sharpe.* (p. 4.)

Lays four or five eggs, about November 15, in a deep hemispherical nest, excavated in the ground, generally near the water, well

* This reference and others like it, placed after the name-headings, refer to a previous report upon the Birds of Kerguelen Island by Dr. J. H. Kidder, U. S. N., *Bull. Nat. Mus.*, No. 2, 1875.

Measurements of eggs are in English inches and decimals. The lengthwise and cross-wise diameters, and, in some cases, the corresponding circumferences, are the dimensions given.

The structure of the egg-shell is described as it appears under a Tolles' $\frac{1}{4}$ -inch triplet.

concealed by grass, and lined with feathers from the breast of the old bird. The eggs vary in shape from a regular ovoid to an ellipsoid, and differ considerably in size. The shell is thin, smooth (as usual in this family), and compactly homogeneous in structure, showing under the lens only very shallow linear depressions. Color is a uniform pale olive-green. Measurements are as follows, the braces including specimens found together in a single nest:—

| Smithson. No. | Orig. No. | Measurements. | Remarks. |
|---------------|-----------|---------------|--------------|
| 17179 | 123a | 1.80 × 1.35 | } Set No. 1. |
| 17180 | 123b | 2.00 × 1.40 | |
| 17181 | 123c | 2.10 × 1.42 | |
| 17182 | 123d | 2.18 × 1.45 | |
| 17183 | 123e | 2.10 × 1.49 | |
| 17175 | 154a | 1.90 × 1.40 | } Set No. 2. |
| 17176 | 154b | 2.18 × 1.50 | |
| 17177 | 154c | 2.00 × 1.50 | |
| 17178 | 154d | 2.08 × 1.49 | |

GRACULUS CARUNCULATUS, (*Gm.*). (p. 7.)

Eggs are two or three in number, first found November 5. Nests are built on rocky shelves in the precipitous faces of cliffs overlooking the sea. The base of the nest is built up to a considerable height, sometimes as much as two feet, and is composed of mud, excrement, and decaying vegetable-matter. Upon this pedestal are arranged blades of grass, inclosing a cup-shaped cavity some ten inches across. It would seem that the old nests are used year after year; a new layer being added each season, so that they differ considerably in height. In shape, the eggs are long sharply-pointed ovoids. The structure of the shell is coarsely granular, and the color is an uniform pale green. Externally, there is the usual considerable calcareous deposit, which appears under the lens to be structureless, chalky, and disposed in masses of unequal thickness. It is here and there striated, wrinkled, or otherwise marked, as if deposited in a soft state, and afterward hardened by exposure to the air, leaving the shell proper partly exposed, especially about the smaller end.

The measurements are as follows :—

| Smithson. No. | Orig. No. | Measurements. | Remarks. |
|---------------|-----------|--------------------|--------------|
| 17195 | 72a | 2.45×1.53 | } Set No. 1. |
| 17195 | 72b | 2.40×1.57 | |
| 17195 | 72c | 2.59×1.57 | |
| 17196 | 73a | 2.60×1.62 | } Set No. 2. |
| 17196 | 73b | 2.50×1.58 | |
| 17197 | 74a | 2.40×1.55 | } Set No. 3. |
| 17197 | 74b | 2.58×1.58 | |

Young.—In addition to the remarks already given upon the young of this bird by Dr. Kidder in his previous paper, the following facts are of interest: Much of the under mandible is pale bluish, the chin yellowish, with a transverse line of demarkation from corner to corner of the mouth, the color being sharply defined against the general blackish hue of the body. The horny tip of the bill is light-colored, as is usual, and the bill otherwise very soft. The aperture of the eye is extremely small; lids light-colored. The wings show the very tardy development noticed by Dr. K. in the case of the legs, being extremely small and soft. Another specimen, some eight or ten inches long, shows the same yellowish color of the pouch, abruptly defined against the blackness of the throat; the eyelids being, however, entirely dark. The wings and legs exhibit the same evidence of very tardy development.

BUPHAGUS SKUA ANTARCTICUS, (*Less.*) *Coues.* (p. 9.)

The nests are shallow cavities in the long grass, sparingly lined with grass-stems, and always situated in a dry spot. Eggs are only two in number in the four instances observed; first found November 17. A single egg was found December 20 in a nest robbed December 3. The shape is a very broad ovoid, tapering rapidly to a sharp point. Shell is brittle and of loose texture, being composed of irregularly prismatic bodies set side by side perpendicularly to the surface. Externally it is coarsely granular. Color is dark olive-drab, marked superficially by irregular blotches of Vandyke-brown. Deeper markings appear as blotches of dark bluish stone-color. The blotches are more plentiful over the butt-end. Those of the same nest agree generally in color, but different clutches show considerable variety of tint. Nos. 134 *a* and *b*, (original number) for example, are generally of a pale olive-gray, and the blotches are scarcely deeper in hue than dirty Indian-yellow.

The measurements are as follows:—

| Smithson. No. | Orig. No. | Measurements. | Remarks. |
|---------------|--------------|---------------|-----------------------|
| | 117 <i>a</i> | 2.80 × 2.15 | } Containing embryos. |
| | 117 <i>b</i> | 2.91 × 2.18 | |
| 17150 | 134 <i>a</i> | 2.85 × 2.00 | } Pale specimens. |
| 17150 | 134 <i>b</i> | 2.92 × 2.05 | |
| 17149 | 200 | 2.70 × 2.10 | Second laying. |

Nos. 117 *a* and *b*, containing embryos, have been sent to Prof. E. S. Morse for examination.

LARUS DOMINICANUS, Vieill. (p. 13.)

Nests are built of grass and sea-weed, near the sea, and are generally wet within. Eggs are three in number, and in shape a pointed ovoid, approaching to pyramidal. The shell is rather stout, brittle, and composed of two distinct layers of about equal thickness. The external layer is coarsely granular in texture, roughly mammillated superficially, and of a dark olive-drab color, blotched by irregular spots of different tints, Vandyke-brown, sepia, slate-color, and brownish-yellow. The slaty markings are within the shell, the others on the surface. As in the case of *Buphagus*, those of the same nest are generally similar in marking, while those of different nests show considerable variety of hue. The internal layer of the shell is closer in texture, of a pale apple-green color, and shows under the lens innumerable small whitish trapezoidal columns set transversely to the surface, in a matrix of a pale-green homogeneous basis-substance. The blotches are more closely aggregated at the large end of the egg than elsewhere, and vary in shade according to their situation, superficial or deep. Some specimens of these eggs are not distinguishable with certainty from those of northern gulls—*Larus argentatus* for example.

The measurements are as follows:—

| Smithson. No. | Orig. No. | Measurements. | Remarks. |
|---------------|--------------|---------------|--------------|
| 17151 | 199 <i>a</i> | 2.93 × 1.90 | } Set No. 1. |
| 17152 | 199 <i>b</i> | 2.87 × 1.92 | |
| 17153 | 199 <i>c</i> | 2.75 × 1.85 | |
| 17154 | 201 <i>a</i> | 2.58 × 1.98 | } Set No. 2. |
| 17155 | 201 <i>b</i> | 2.53 × 1.92 | |
| 17156 | 201 <i>c</i> | 2.58 × 2.00 | |

The young, a few days old, have the bill black, with yellow tip, the feet dull blackish, webs partly dull whitish. The general plumage is black, mottled with yellowish-brown, much paler, inclining to white, below, as usual in this family of gulls.

In embryos about to be hatched, the bill and feet are nearly colorless; the former somewhat mottled with black. The general plumage, so far as it can be determined from wet preparations, is much as has been already described.

STERNA VITTATA, Gm. (p. 17.)

The single egg is laid on high and broken ground, usually under the lee of a tuft of grass, and with little or no preparation. First found November 7. The shell is thin, elastic, and finely granular in texture, of general olive-green color. The ground-color varies widely, as usual in this family of birds, from rather clear green, with a suspicion of drab, to a decided brownish drab. Superficial markings are chocolate-brown of several shades, disposed in irregular spots and blotches, rather more thickly crowded toward the larger end. Deep markings show various shades of bluish slate-color, according to the thickness of the overlying deposit. The shape of the egg is a regular ovoid, and the measurements are as follows:—

| Smithson. No. | Orig. No. | Measurements. |
|---------------|-----------|---------------|
| 17188 | 61 | 1.78 × 1.22 |
| 17187 | 75 | 1.82 × 1.29 |
| 17184 | 76 | 1.82 × 1.27 |
| 17185 | 77 | 1.83 × 1.30 |
| 17186 | 78 | 1.75 × 1.23 |
| 17189 | 96 | 1.85 × 1.20 |
| | 97 | 1.80 × 1.25 |
| | | 1.70 × 1.27 |

The young, when first fledged, is yellowish-brown, spotted irregularly with black; its bill, toes, and tarsus dirty-orange, blackening toward tips. Later, the colors grow darker, feet and tarsi becoming orange-red. It is as large as a chick, and very unlike the old bird in marking and general appearance. Specimens of the embryos have been sent to Professor Morse for examination.

DIOMEDEA EXULANS, Linn. (p. 19.)

Nests are on tall mounds, built up of grass to the height of two or more feet from the ground, and, being of different heights, seem to have

been used again and added to year after year. The egg is single, elliptical in longitudinal section, and but slightly thicker at the large than at the small end. Only occasional specimens tend somewhat to the ovoid form. The shell is white, of loose granular texture and roughly mammillated surface. There are no markings beneath the superficial calcareous layer, and the spots which appear on this seem to be adventitious stains from the secretions of the oviduct, or accidental soiling after extrusion. Some specimens show a reddish stain upon the larger end, probably dried blood, since it is readily washed off.

The measurements are as follows:—

| Smithson. No. | Orig. No. | Length. | Width. | Long circumf. | Short circumf. |
|---------------|-----------|---------|--------|---------------|----------------|
| 17097 | 222a | 4.96 | 3.18 | 13.15 | 9.65 |
| 17098 | 222b | 5.08 | 3.08 | 13.15 | 9.70 |
| 17099 | 222c | 4.80 | 3.18 | 12.90 | 10.04 |
| 17100 | 222d | 5.21 | 3.25 | 13.80 | 10.50 |
| 17101 | 222e | 4.80 | 3.10 | 12.80 | 9.60 |
| 17102 | 222f | 4.88 | 3.22 | 13.10 | 10.18 |

No young were hatched previous to January 11.

PHŒBETRIA FULLIGINOSA, (*Gm.*) *Reich.* (p. 21.)

Nests on rocky shelves or in caves in the faces of lofty cliffs where the birds build a conical mound, seven or eight inches high, hollowed into a cup at the top and lined rudely with grass. Egg is single, broadly ovoidal, generally white, marked by a collection of specks about the larger end, somewhat like the adventitious stains on the eggs of *D. exulans*, but, as well as we can judge, less superficial. The shell is compact in structure, rather thin for its size, and superficially smooth to the touch. Under the lens, it is seen to be marked by minute pits and linear depressions, being thus decidedly different, both to the eye and to the touch, from those of *D. exulans*.

The measurements are as follows:—

| Smithson. No. | Orig. No. | Length. | Width. | Long circumf. | Short circumf. |
|---------------|-----------|---------|--------|---------------|----------------|
| 17104 | 52 | 3.95 | 2.64 | 10.50 | 8.40 |
| 17103 | 86 | 3.95 | 2.60 | 10.50 | 8.25 |

An embryo has been sent to Professor Morse for examination.

OSSIFRAGA GIGANTEA, (*Gm.*) *Reich.* (p. 23.)

Lays a single egg on open, rather elevated ground, at some distance (half a mile) from the sea. There was no vestige of an artificial nest when the young were found, January 2. These were then nearly fledged, and quite as large and heavy as the adults, occupying natural hollows between mounds of *azorella*. They are exceedingly filthy birds, ejecting the contents of their stomachs for two or three feet from their bodies, and seeming to have a limitless supply to draw upon. When disturbed, they are soon surrounded by a puddle of vomited matters, and are, in this condition, by no means pleasant birds to collect. Among the ejecta were noticed many Penguin feathers. In the same neighborhood was a young bird of an earlier brood, fully fledged, but not yet able to fly. These Petrels must therefore be among the earliest in laying. The down of the young bird is entirely gray in color, the head is partly naked, and the bill, tarsi, and feet are colored nearly as in the adult, but somewhat paler. The first fully-formed feathers are similar to the adult plumage.

MAJAEQUEUS ÆQUINOCTIALIS, (*Linn.*) *Reich.* (p. 25.)

Nests in very deep burrows in hill-sides, generally under a mound of herbage. Near the entrance to the burrow, there is always, so far as observed, a small pool of fresh water. Egg is single, regularly ovoid, and white, without shell-markings of any kind. It is generally, however, much soiled by secretions from the oviduct and dirt from the burrow. The shell is thin, homogeneous, and compact in structure, very smooth to the touch, but under the lens is seen to be marked by small pits and shallow linear depressions.

The measurements are as follows:—

| Smithson. No. | Orig. No. | Measurements. |
|---------------|-----------|---------------|
| 17105 | 189a | 3.00 × 2.10 |
| 17106 | 189b | 3.08 × 2.12 |
| 17107 | 189c | 3.18 × 2.19 |
| 17108 | 189d | 3.17 × 2.17 |
| 17109 | 189e | 3.32 × 2.13 |
| 17110 | 189f | 3.14 × 2.20 |
| 17111 | 189g | 3.26 × 2.17 |

No young birds were identified as of this species.

ÆSTRELATA LESSONI, (*Garn.*) *Cass.* (pp. 27, 39.)

On pages 26 and 27 of the report preceding this, upon the birds of Kerguelen Island,* were described a series of undetermined young birds, with the note by Dr. Coues, "Not seen by me—probably some *Puffinus*." Upon examination of the specimens preserved, there remains no reasonable doubt that they are the young of *Æstrelata lessoni*. The bill is that of an *Æstrelata*, and the measurements agree closely with those of *Æ. lessoni*, both from dried skins in the museums of the Philadelphia Academy and Smithsonian Institution, and as taken by Dr. Kidder from the recent specimens. These young birds were found on Kerguelen Island as early as September 15, living in deep burrows in hill-sides. At about the same time, an adult specimen was brought into camp by one of the men attached to the party, with the statement that it had been found with young, but was unfortunately not preserved, and the old birds were not found again until December 29, in a burrow without egg or young. It will be remembered that *Æ. kidderi*, the only other species of the genus known to be found on the island, was taken with egg on October 21, and is thus excluded from consideration. From the Proceedings of the Philadelphia Academy for 1866,† we extract the following description of the young of *Æ. lessoni*:—

"No. 15709, Smiths. Register, Terra del Fuego, T. R. Peale.—Entire upper parts dusky fuliginous-brown; the dorsal feathers usually with somewhat light margins; the color deepening on the wings and back into brownish-black. Some of the secondaries, tertials, and upper coverts have a slight cinereous tinge. On the head and nape, the brown is lighter than elsewhere; and a somewhat diluted shade of this color extends adown the throat, thus completely enveloping the head, and occupies likewise the upper half of the breast, quite across, as well as all the sides under the wings. On the crissum, and especially on all the under tail-coverts, except immediately around the anus, the color again deepens into brownish-black. The rest of the under parts are white. The circumocular region is darker than the adjacent parts.

"The foregoing is the most immature plumage known to me, and it will be noticed that not only the colors themselves, but the pattern of coloration, is radically distinct from those of the adults. In some specimens is recognizable a faint shade of a darker color on the tips of the feath-

* *Op. cit.* vide note to p. 1 of this report.

† Critical Review of the Family Procellariidæ, part iv, by Dr. Elliott Coues, U. S. A., p. 144.

ers of the otherwise white under parts ; whence I infer that in very young birds the whole under parts may be brownish or grayish."

In the more advanced of the two specimens preserved (original No. 62), the entire body is as black as a crow. On the breast, however, and under parts generally, the bases of the feathers show white to near the ends, while upon the crissum and about the head they are grayish. The surmise of Dr. Coues, therefore, with regard to the young plumage, was in the right direction, but did not go far enough. The indications of an adult white and gray plumage are unmistakable.

The very young birds first found were completely covered, as is usual in the family, with slate-colored down. The same covering is plentiful upon the younger of the two specimens preserved (original No. 66), and still distinct upon the elder.

Below are contrasted three sets of measurements, viz : those of adult skins by Dr. Coues, and the young of the same from recent specimens by Dr. Kidder :—

| Smithson No. | Orig. No. | Sex. | Length. | Ext. | Wing. | Tail. | Bill. | Head. | Tarsus. | Hind toe. | Longest claw. | Remarks. |
|--------------|-----------|-------|---------|--------|--------|-------|-------|-------|---------|-----------|---------------|-------------------------|
| ..... | ..... | ..... | ..... | ..... | 11. 75 | 5. 25 | 1. 50 | ..... | 1. 65 | 2. 00 | 0. 50 | Adult skin (Coues). |
| 68969 | 211 | ♀ | 18. 15 | 43. 00 | 12. 15 | 5. 85 | 1. 50 | 2. 50 | 1. 85 | 2. 20 | 0. 50 | Adult, recent (Kidder). |
| ..... | 62 | ..... | 16. 00 | 38. 75 | 12. 00 | 5. 40 | 1. 40 | 2. 50 | 1. 65 | 2. 10 | 0. 40 | Young, recent (Kidder). |

It should be noted that the measurements of tail, bill, head, tarsus, middle toe, and claw of the last specimen were taken from the skin, and are therefore not "recent."

ŒSTRELATA KIDDERI, *Coues.* (p. 28.)

Nests in deep burrows excavated in a hill side, each burrow containing a little pool of fresh water near its entrance. Egg is single, dull white, and very obtusely ovoid in shape, almost as globose as a Penguin's egg ; first found October 11. Shell is thin, brittle, of compact structure, and marked externally by very shallow linear depressions, discernible only by aid of a lens. There are no color-markings.

The measurements are as follows :—

| Smithson. No. | Orig. No. | Measurements. |
|---------------|-----------|---------------|
| 17157 | 35a | 2. 18 × 1. 77 |
| 17158 | 35b | 2. 20 × 1. 75 |
| 17159 | 35c | (Broken.) |

A young bird taken December 13, and much resembling that of *Æ. lessoni*, but far less advanced than the latter at that date, was then attributed to this species, although, the old bird not having been taken at the same time, the evidence was not positive. It made no sound when taken from its burrow. Subsequent examination of the specimen fully confirms this surmise. The bird is still covered with pale slaty down; but the shape of the bill, and especially its narrowness from base to tip, taken in connection with the dates, place the identification beyond a reasonable doubt.

OCEANITES OCEANICA, (*Kuhl*) *Coues*. (p. 30.)

Nests under rocks, usually on pretty high land, laying a single white egg. There are no eggs in the collection; but one was found by Rev. Mr. Eaton, of the English party, on Thumb Mountain, some fifteen miles from the American station, December 8.

PROCELLARIA NEREIS, (*Gould*) *Bp.* (p. 31.)

Nests under tufts of grass, or other low herbage, near the sea. Sometimes it digs a small burrow; oftener the eggs are found simply covered by overhanging grass-stems, in low land. The egg is single, compact in structure, smooth, and very fragile, ellipsoidal in form, and white, excepting at the larger end, which is marked by a collection of small reddish spots interspersed with a few specks of very dark brown. If we are correct in our impression that the markings about the butts of these eggs are not adventitious, we have here an exception to the general rule that the *Procellariidæ* lay white eggs. In size, shape, and coloration, the egg recalls some of the least-spotted examples of that of the common Meadow Lark (*Sturnella magna*). By aid of the lens are to be seen a few pore-like punctations, widely scattered.

The measurements are as follows:—

| Smithson. No. | Orig. No. | Measurements. |
|---------------|-----------|---------------|
| 17194 | 157 | 1.30 × 0.95 |

We have no information concerning the young of this species, none having been hatched at the time of breaking up the American station (January 11).

PSEUDOPRION DESOLATUS, (*Gm.*) *Gray*. (p. 32.)

Nests in the same localities and has the same habits as *Halobana cœrulea* (q. v.).

HALOBÆNA CÆRULEA, (Gm.) Bp. (p. 34.)

Nests in deep tortuous burrows in hill-sides near the sea. Egg is single, ovoidal, and dull white, without color-markings. In the specimens measured, there is, however, as shown by the figures, the usual range of variation in contour. They remind one, in size and shape, of the eggs of a bantam hen. Shell is thin, homogeneous, and compact in structure, presenting under the lens a finely granular external surface. First found October 23.

The measurements are as follows:—

| Smithson. No. | Orig. No. | Measurements. |
|---------------|-----------|---------------|
| 17161 | 49a | 2.00 × 1.50 |
| 17162 | 49b | 2.08 × 1.44 |
| 17163 | 49c | 2.09 × 1.57 |
| 17164 | 49d | 2.00 × 1.45 |
| 17165 | 49e | 1.90 × 1.50 |
| 17166 | 49f | 1.96 × 1.47 |
| 17167 | 49g | 1.92 × 1.48 |
| 17168 | 49h | 2.10 × 1.46 |
| 17169 | 49i | 1.95 × 1.48 |
| 17170 | 49j | 2.07 × 1.54 |
| 17171 | — | 2.02 × 1.45 |
| 17171a | 41 | 1.91 × 1.52 |
| 17172 | 63 | 2.08 × 1.43 |
| 17173 | 71 | 1.90 × 1.47 |

The newly-hatched young have bill and toes slaty blue, with apparently pale-yellowish webs and brownish-black claws. The horny speck upon the bill is whitish, and situated high above the tip of the bill. The region about the base of the bill is largely denuded. They begin to hatch about November 12.

PELECANOIDES URINATRIX, (Gm.) Lacépède, (p. 36.)

Lays one egg in a burrow in the hill-side, generally selecting the same locality as *Halobæna cærulea*. Burrow is straight, slanting slightly downward, and less deep than that of *Halobæna*. Egg is a regular ovoid, tending in some specimens to ellipsoidal. First found December 10. Shell is white, thin, brittle, compact, and homogeneous in structure. No color-markings.

The measurements are as follows:—

| Smithson. No. | Orig. No. | Measurements. | Remarks. |
|---------------|-----------|--------------------|---------------|
| 17191 | 190a | ----- | Badly broken. |
| 17192 | 190b | 1.62×1.15 | Broken. |
| 17193 | 190c | 1.62×1.27 | |
| 17174 | 136 | 1.66×1.26 | |
| 17190 | 152 | 1.65×1.25 | |

No young birds were found during the visit of the American party to the island.

APTENODYTES LONGIROSTRIS, *Scop.* (p. 39.)

No eggs or young in the collection. It is of this genus that the statement is made that the eggs are incubated in a sort of pouch, formed of a fold of skin, and situated between the tibiae. The whalers met at Kerguelen Island confirm this statement; but no opportunity for direct personal observation was found during the stay of the transit-party. The male and female are said by the whalers to alternate in carrying the egg around.

PYGOSCELIS TÆNIATA, (*Peale*) *Coves.* (p. 41.)

Had already begun to lay September 10, selecting the top of a mound of *Azorella* (a densely-growing plant common on the island), and scratching therein a shallow cavity. But one egg was found at any time in a nest; yet we have good reason for believing that these Penguins rear two young in a season, laying a second egg about two months after the first, and before the young bird has left the nest. The eggs are obtusely ellipsoid, some specimens being almost spherical; white, with a very pale greenish tint. The shell is thick, inelastic, and friable, covered by a thin layer of calcareous matter that looks precisely as if it had been daubed on with a coarse brush. The specimens preserved, being from a rookery which has been often robbed, are doubtless smaller and thinner-shelled than those of the first laying.

The measurements are as follows:—

| Smithson. No. | Orig. No. | Measurements. |
|---------------|-----------|--------------------|
| 17112 | 5 | 2.50×2.08 |
| 17113 | 6 | 2.61×2.00 |
| 17114 | 7 | 2.52×2.17 |
| 17115 | 8 | 2.42×2.05 |
| 17116 | 9 | 2.68×2.18 |
| 17117 | 10 | 2.32×2.10 |
| 17118 | 11 | 2.70×2.20 |
| 17119 | 12 | 2.69×2.18 |
| 17120 | 13 | 2.58×2.10 |
| 17121 | 14 | 2.40×2.18 |
| 17122 | 15 | 2.49×2.18 |
| 17123 | 16 | 2.45×2.17 |

Young birds were found just breaking the shell December 4. They are hatched much earlier when the rookeries are not so often robbed: as early as October 12, certainly. When first hatched, the young are covered with soft, hairy, pearl-gray down. Head black above and behind; bill flesh-colored; feet black on the soles and flesh-colored above.

EUDYPTES CHRYSOLOPHA? Brandt. (p. 45.)

Begins to lay about the first of December, building among fallen rocks by the sea, making nests which are more complete than those of *Pygoscelis taniata*, and lining them with dried grass. There are two eggs to a nest, white, with a faint tinge of greenish, obtusely ovoid in shape, and usually one is distinctly larger than the other. The shells are thick, friable, inelastic, and often smeared in parts with calcareous deposit. The external surface is punctured by minute pores, scattered widely apart, but presents no distinct surface-marking.

The measurements are as follows:—

| Smithson. No. | Orig. No. | Measurements. |
|---------------|-----------|--------------------|
| 17124 | — | 2.83×2.05 |
| 17125 | — | 2.60×2.07 |
| 17136 | *124e | 2.56×1.88 |
| 17137 | 124a | 2.89×2.16 |
| 17138 | 124b | 2.39×1.92 |
| 17139 | 124c | 2.79×2.20 |
| 17140 | 124d | 2.50×1.79 |
| 17141 | 124e | 3.04×2.18 |
| 17142 | 124f | 2.52×1.89 |
| 17143 | 124g | 2.84×2.12 |
| 17144 | 124h | 2.58×2.00 |
| 17145 | 124i | 2.80×2.30 |
| 17146 | 124j | 2.58×1.93 |
| 17147 | 124k | 2.80×2.11 |
| 17148 | 124l | 2.81×2.02 |
| 17126 | 134a | 2.94×2.15 |
| 17127 | 134b | 2.82×2.19 |
| 17128 | 134c | 2.95×2.15 |
| 17129 | 134d | 2.83×2.10 |
| 17130 | 134e | 2.32×1.80 |
| 17131 | 134f | 2.82×2.04 |
| 17132 | 134g | 2.50×1.99 |
| 17133 | 134h | 2.86×2.10 |
| 17134 | 134i | 2.82×2.15 |
| 17135 | 134j | 2.70×1.95 |
| 17160 | — | 2.52×1.80 |

* Original number duplicated.

EUDYPTES DIADEMATUS, *Gould.* (p. 47.)

We have no direct information concerning the nesting or eggs of these birds. Whalers report that their habits in these respects are precisely similar to those of *E. chrysolopha*, as was to be expected.

BOTANY.

A.—PHÆNOGAMIA, FILICES, ET LYCOPODIACEÆ.

REVISED BY PROF. A. GRAY.

I.—RANUNCULACEÆ.

1. *RANUNCULUS CRASSIPES*, *Hook. fil.*—Very common in and by fresh-water pools, and pretty well up on the hill-sides, among *Acæna*, and in crevices of wet rocks. Varies greatly in size and vigor of growth in different localities. Begins to flower about December 15.

2. *RANUNCULUS TRULLIFOLIUS*, *Hook. fil.*—In small pools and running streams of fresh water. Not uncommon, but not found in flower. In two forms [the larger answering well to Dr. Hooker's specimens from the Falkland Islands; the smaller, with some entire leaves apparently much too near *R. hydrophilus*, Gaud. Neither of the two were before recorded from Kerguelen Island.—A. G.].

3. *RANUNCULUS* ——— ?—In low land, between two arms of the sea. Not in flower up to January 2. Found in company with *R. crassipes*, which here grew much more luxuriantly than near the station (among the hills). [A succulent species, with rounded and somewhat-caudate leaves, an inch or more in diameter, deeply and obtusely 3-7-lobed, on fleshy petioles a span or more long. It can hardly be a form of the preceding.—A. G.]

II.—CRUCIFERÆ.

1. *PRINGLEA ANTISCORBUTICA*, *R. Brown.*—"Kerguelen cabbage" grows abundantly near the sea-shore, and I have seen it as high as 2,000 feet (Mount Crozier), where all other Phænogams but *azorella* had given place to Mosses and Lichens. Perennial, stout creeping rhizomes, sometimes 5 or 6 feet long and as many inches in diameter, stated by Dr. Hooker to be apetalous, on the authority of Mr. Anderson, who visited Kerguelen with Captain Cook ("*petala nulla!*" *Fl. Antaretica*),

but I have found very many flowers with a single petal, clawed and faintly pink-tinted at the large end; many with two, some with three, and a few with four petals. They fall early and are easily overlooked when present. Axillary flowers are more frequently petalous than those crowded together upon the spike-like raceme. Observed to be in flower November 2. The leaves were eaten, as cabbage, by ourselves and the ship's company of the *Monongahela* with relish; our fowls were fond of them, and they constituted the staple food of the live stock brought to the island by the English party and the *Monongahela*.

III.—CARYOPHYLLÆ.

1. *COLOBANTHUS KERGUELENSIS*, *Hook. fil.*—Found with ripe fruit January 2, growing in both high and low land, among loose gravel and between stones.

IV.—PORTULACÆ.

1. *LYALLIA KERGUELENSIS*, *Hook. fil.*—Grows by preference on the sides of stony hills, almost always the southwest side, where it is exposed (by rapid drainage and heavy rains) to frequent alternations of dryness and moisture. Root thick, long, fleshy, and partly exposed above ground. One specimen was found straddling a good-sized stone, sending down roots on all sides. Flowers were first observed December 14, and the plant was already in seed December 21, when no flowers could be found. The flowers are not "very inconspicuous," as Dr. Hooker supposed they might be. They are plentiful, although apetalous, and prominent as to their stamens and pistils, lending a pale yellowish-green bloom to the mound which the plant forms, and quite conspicuous enough to attract the attention of the casual observer. Neither can the plant be properly said to be "very local," in this part of the island at least, since, although rare, many are usually found collected together in the same place. [Dr. Hooker's specimens had only the capsules and calyx. With the present complete specimens, the whole structure of the flower is made out. The sepals are four, thin, somewhat petaloid, oval, nearly unconnected. Petals none. Stamens three, hypogynous or nearly so, larger than the calyx, two of them alternate with sepals, and one before a sepal; anthers didymous, two-celled. Style larger than the ovary, two-cleft at summit, the lobes linear, stigmatic for the whole length of the inner face. Ovules two or three from the base of the cell, campylotropous. Utricle fleshy, coriaceous, apiculate with the persistent base of the style, apparently indehiscent. Seeds two or three. Testa small.—A. G.]

2. *MONTIA FONTANA*, *L.*—Flowers were first observed December 7. Habitat among gravel, near the sea, and (as remarked by Dr. Hooker) almost always very near *Callitriche verna* and *Ranunculus crassipes*.

V.—ROSACEÆ.

1. *ACÆNA AFFINIS*, *Hook. fil.*—"Kerguelen Tea." The leaves have a considerable reputation among the whalers as a febrifuge and antiscorbutic. They are used as an infusion, hence the trivial name. Abundant everywhere, especially on northeast hill-sides near the sea and in low land. In the flowering state, the specimens accord well with the *A. adscendens*, as described and figured by Dr. Hooker; but in fruit the characters relied upon to distinguish the two become quite apparent.

VI.—HALORAGÆÆ.

1. *CALLITRICHE ANTARCTICA*, *Engelm. in Hegel MS. Syst. Callitr. (C. VERNA, Hook. fil, Fl. Antarc.)*.—Grows in wet places, generally in company with *Ranunculus crassipes*, often under water or beneath precipitous rocks overhanging and limiting rocky sea-beaches. Flowers first observed December 17. *Montia fontana* is generally to be found near at hand.

VII.—CRASSULACEÆ.

1. *BULLIARDA MOSCHATA*, *D'Urv.*—Small, white, perfect, regular, tetramerous flowers, first observed in bloom December 18. Pistils and stems blood-red. Plentiful in crevices of rocks overhanging and closely neighboring to the sea.

VIII.—UMBELLIFERÆ.

1. *AZORELLA SELAGO*, *Hook. fil.*—One of the commonest plants, growing in mounds closely compacted together, often 2 to 4 feet in diameter, and composed of the dead stalks of old plants. Owing to the density of this crowding, only the surface is green, while deeply in the interior the old stems and leaves seem to be partly transformed into peat. It is this plant which makes walking so fatiguing on this island. The foot sinks into the soft mass at every step, and the hillocks are so closely joined together that for long distances it is impossible to avoid them. I could not find the hairs or bristles figured and described by Dr. Hooker as appearing upon the upper surfaces of the leaves along their venation (*Fl. Ant.* p. 284). Flowers were first observed November 12, like small starry points, scattered over the mounds. They are never very conspicuous, and do not press well, owing to the strength and

resistance of the stems. Not pink as figured (*Fl. Ant.*), but always pale greenish-yellow. Here and there is a patch of discolored leaves, white or yellow.

IX.—RUBIACEÆ.

1. *GALIUM ANTARCTICUM*, *Hook. fil.*—A small trailing plant, found as undergrowth with *Acana*, Grasses, Ferns, etc., generally near the sea, but extending well up the hill-sides. Flowers first observed December 3. “Flores sessiles, albi, trimeri” (*Fl. Ant.* p. 303). I have found them quite as often 4-petaled as 3-petaled, and with a distinct peduncle. A single 5-petaled flower was found January 5.

X.—COMPOSITÆ.

1. *LEPTINELLA PLUMOSA*, *Hook. fil.*—First observed in flower November 30. This plant fringes the cliffs overlooking the sea, grows down to high-water mark in the low-land, and marks the “roads” to Penguin rookeries and the rocks frequented by Cormorants. It grows very thickly, forming a flat matted carpet very welcome to the eye of the wearied pedestrian, less on account of the silvery luster of its leaves than because it is a certain indication of firm ground. A decoction of the leaves is used by the whalers as an emetic, and is said to be prompt and effectual in its action.

XI.—GRAMINEÆ.

1. *TRIODIA KERGUELENSIS*, *Hook. fil.*—Flowers were first observed December 2. Grows among cliffs, altitude 300 to 2,000 feet. Very long, filiform roots.

2. *FESTUCA COOKII*, *Hook. fil.*—Very common in hollows on hill-sides near the sea. Flowers early in May. A fine large grass. [The plants seem to be male only; if fertile, they are in a much earlier state of inflorescence than Dr. Hooker’s specimens.—A. G.]

3. *FESTUCA ERECTA*, *D’Urv.*—A straight, tussocky grass, with purple panicles, observed in flower December 6. Found in flat land, altitude 200 feet, about a mile from the sea.

4. *AIRA ANTARCTICA*, *Hook.*—A graceful grass, with oat-like panicles. Found in flower near the sea-shore December 21. Also observed among cliffs at considerable altitudes.

XII.—FILICES ET LYCOPODIACEÆ.

1. LOMARIA ALPINA, *Hook. fil.*—Dr. Hooker mentions this Fern as “very scarce”. We found it exceedingly common; mostly barren.

2. POLYPODIUM (GRAMMITIS) AUSTRALE.—In crevices of rocks; rare. New to Kerguelen Island.

3. POLYPODIUM VULGARE.—Crevices of rocks by running streams; altitude 200 feet and upward. Abundant. New to the island.

4. CISTOPTERIS FRAGILIS.—Not common. Crevices of rocks near hill-tops. [* No specimens in the collection.—A. G.] New to the island.

5. LYCOPODIUM SELAGO, *Linn.*—Rare.

6. LYCOPODIUM CLAVATUM (var. MAGELLANICUM).—More common, but very local.

B.—MUSCI.

DETERMINED BY THOMAS P. JAMES, ESQ.

1. ANDRÆA MARGINATA, *Hook. fil. & Wils. Fl. Antarc. ii, p. 356, t. 151, f. 1.*—On high rocks, 1,500 feet altitude.

2. CERATODON PURPUREUS, *Brid. Br. Univers, i, p. 480.*—In a variety of forms; very common.

3. GRIMMIA FRONDOSA, *James, sp. nov.*—“Laxe cæspitosa vixitæ fastigiata, ramosa, fusco-viridis, gracilis; folia erecto-patentia, cœcava curvata anguste lanceolata canaliculata, in pilum hyalinum sublævem terminata, costa sub pilo evanida; inferne depilia rigida acuminata; marginis erecta, cellulis basi oblongis laxioribus flavidis et usquæ medium folii quadratis superne remotis subrotundis versus apicem obscuris.”

Growing with *Andreæa marginata*; found only in a barren condition.

4. GRIMMIA KIDDERI, *James, sp. nov.*—“Compacte globosa, pulvinata, pusilla fastigiata, ramosissima, atrato-viridis, rigida; folia caulina densissima, erecta patentia anguste lanceolata, interiora canaliculata acuminata strictiuscula superiora elongata curvula in pilum brevem hyalinum sublævem producta; nervo ad basin lato infra apicem evanido margine erecta, cellulis basi angustis elongatis flavidis pellucidis superne sensim quadratis minutis subopacis.”

Growing in small globular masses on hill-sides at some distance from the sea. The small balls formed by this curious moss seem not to be rooted to any other plant, but to be blown about by the wind indiscrim-

* Probably lost in transportation. The identification was given me by Rev. A. E. Eaton, of the English transit-party.—J. H. K.

inately. The detached masses generally were found disposed in a fan-shape, radiating apparently from a central point, as if a larger mass in which they had been aggregated had been broken up by the force of the wind. Found only in a barren state. Very local.

5. *RACOMITRIUM LANUGINOSUM*, *Brid.* i, p. 402, t. 152.—Abounds on high rocks.

6. *ORTHOTRICHUM CRASSIFOLIUM*, *Hook. fil. & Wils.* l. c. p. 125, t. 57, f. 8; var. β . *acutum*, *C. Müll. Syn.* i, p. 691.—This plant is monocious, the male gemmæ being found terminal on separate, many-branched plants; also at the base of the female plants.

7. *WEBERA CRUDA*, *Schreb. Spic. Fl. Lips.* p. 83.—In the shade of, and in the crevices of rocks; appearing in many forms.

8. *WEBERA ALBICANS*, *Whlb. Fl. Lips.* p. 353.—In wet, mostly springy places.

9. *WEBERA NUTANS*, *Schreb.* l. c. p. 81, var. β . *cæspitosa*.—In wet situations on mountain-sides.

10. *WEBERA NUTANS*, *Schreb.* var. γ . *bicolor*.—In shady places near the sea.

11. *BRYUM WARNEUM*, *Bland.* in *Brid.* p. 675.—Growing with *Bryum bimum*. Not common.

12. *BRYUM GAYANUM*, *Mont.* in litt. *C. Müll. Syn.* i, p. 267.—Rare.

13. *BRYUM BIMUM*, *Schreb.* l. c. p. 83.—Common in wet and boggy places.

14. *BRYUM TORQUESCENS*, *Br. & Schp. Bry. Eur. fas.* 6-9, p. 49, t. 20.—From the rear of the transit-house, near the sea.

15. *BRYUM PALLESCENS*, *Schwaeg. Sup.* i, ii, p. 107, t. 75.—In damp situations.

16. *BRYUM ARGENTEUM*, *Linn. Sp. Pl.* p. 1586.—On exposed rocks and on bare ground.

17. *BARTRAMIA PATENS*, *Brid. Sp. Mus.* iii, p. 82.—Among shaded rocks.

18. *BARTRAMIA FLAVICANS*, *Mitt.* in *Hook. Kew Jour.* iii, 55.—Rear of the transit-house, among rocks.

19. *BARTRAMIA APPRESSA*, *Hook. fil. & Wils. Fl. Nov. Zel.* 89, t. 86, f. 5 = *B. exigua*, *Sulliv. U. S. Exp. Exped.*

20. *CATHARINA (ATRICHUM) COMPRESSA*, *C. Müll. Syn.* i, p. 95.—*Polytrichum compressum*, *Hook. fil. & Wils.* l. c. ii, p. 410, t. 153.—On hill-sides upon wet rocks.

21. *PLAGIOTHECIUM DONIANUM*, *Sm. Eng. Bot.* i, 1446.—*Hypnum den-*

ticulatum, Linn.—*H. obtusum*, Whlb.—On shaded ground, with *Webera cruda*.

22. *HYPNUM GRACILLIMUM*, *Hrsch.* Fl. Bras. i, p. 78.—Found deep in the interior of a small dark cavern in a rock; 300–400 feet altitude; caves had been tenanted by birds.

23. *HYPNUM UNCINATUM*, *Hedw.* Musc. Fr. iv, p. 65, t. 25.—Abundant on hill-sides, among and on the sides of *azorella* mounds.

24. *HYPNUM FLUVIATILE*, *Sw.* Musc. Suec. p. 63.—On wet and damp rocks in rear of transit-house, and other localities.

25. *HYPNUM FRIGIDUM*, *C. Müll.* in Bot. Zeit. 1856.—Growing with *Bryum Warneum*.

26. *HYPNUM LECHLERI*, *C. Müll.* l. c. 456, 1856.—On low ground.

27. *HYPNUM FLUITANS*, *Linn.* Fl. Suec. p. 1074.—In fresh water and among bogs.

28. *HYPNUM RIPARIUM*, *Linn.* Sp. Pl. p. 1596.—Growing with *Ranunculus crassipes* in wet places.

C.—LICHENES.*

DETERMINED BY PROF. EDW. TUCKERMAN.

The Lichens of this island were first observed by Dr. J. D. Hooker during the voyage of the *Erebus* and *Terror* (1839–1843), and his specimens were studied by Dr. Thomas Taylor, according to whose reckoning (*Lich. Antaret.* in Lond. Journ. Bot. 3, p. 634) the whole number of species was sixteen. Dr. Taylor's herbarium is now included in that of the Boston Society of Natural History, but contains unfortunately very little to illustrate his Kerguelen determinations; and the lack of microscopical analysis makes it difficult, therefore, to avail ourselves of his work.

The collection now before me, made by Dr. Kidder, naturalist of the United States Transit Expedition of the present year, contains more or less satisfactory evidence of as many as twenty species, though not all of them determinable. Adding the three found in the Taylor herbarium, the whole number, according to this reckoning, will be twenty-three. And as eight or nine others are found in Taylor's list, there is no doubt that this little Lichen-Flora is larger than it was taken to be.

1. *USNEA SULPHUREA*, *Müll.* Th. Fr.—*U. melaxantha*, Ach.—Rocks.—According to Taylor, the place of this well-known antarctic lichen is taken in Kerguelen's Land by another, the *U. Taylори*, J. D. Hook.,

* Extracted from the Bulletin of the Torrey Botanical Club, October, 1875, pp. 57–59.

called "handsomest of the vegetable products of this the island of Desolation". But this last, though received by Nylander (*Neuropogon Taylori*, Nyl. Syn. i, p. 273), is hardly well discriminated from the older species by the description of either author; and I cannot separate any of the numerous specimens before me from others got, during the same voyage, at the Falkland Islands (Herb. Hook.), which Taylor and Nylander appear to have referred to *U. melanantha*.

2. *PANNARIA TAYLORI*, *sp. nov.*—Thallo foliaceo cartilagineo appresso luteo-fulvo, lobis apice rotundatis crenatis incisisque, subtus nigris hypothallo obsolescente; apotheciis (demum plusquam 2 millim. latis) lecanorinis sessilibus, margine crasso ruguloso, disco plano fuscescente. Sporæ ellipsoideæ, simplices, incolores, 0,016–21^{mm} long. 0,009–11^{mm} crass.—Rocks, *Hooker* (Herb. Taylor).—Medullary layer of compact, elongated cells. Collogonidia 0,002–5^{mm} in diameter, solitary or in chains of 2–5. The specimen is rather more than an inch across. It occurs with *Placodium elegans*, but wrapped apart, in Dr. Taylor's collection.

3. *PANNARIA GLAUCELLA*, *sp. nov.*—Thallo foliaceo cartilagineo arcte appresso glauco-cinerascente, subtus pallido hypothallo obsoleto, lobis radiantibus subintegris; apotheciis (0^{mm}. 006–8 latis) lecanorinis adnatis, margine integro demisso, disco dein convexo fusco-nigro. Sporæ immaturæ.—Rocks.—Specimens scarcely half an inch across. Elongated cells of medullary layer compact. Collogonidia 0,004–9^{mm} in diameter, in chains often of 4–10.

4. *PLACODIUM ELEGANS*, *Link. D. C.*—Rocks, *Hooker* (Herb. Tayl.).—Spores 0,010–17^{mm} long and 0,007–9^{mm} thick. Called *Lecanora murorum* by Dr. Taylor (Herb.), but not reckoned in his *Lichenes Antart. l. c.* It is perhaps better referable as above.

5. *PLACODIUM BICOLOR*, *sp. nov.*—Thallo crustaceo-aduato rimoso-areolato aurantiaco, cephalodio centrali (6–10^{mm}. lat.) pluribusve depressis radiatim rimoso, concoloribus onusto, ambitu lobato; apotheciis (2–3^{mm}. lat.) sessilibus, disco plano nigro-fusco, margine tenui demisso subintegro. Sporæ in thecis uniserialiter octonæ, ellipsoideæ, polaribiloculares, 0,020–30^{mm} lat., 0,012–20^{mm} crass., paraphysibus capillari-bus.—Rocks.—Collogonidia of the cephalodia 0,006–9^{mm} in diameter, reddish, solitary or in short chains. The name and much of the character of *Lecanora dichora*, Tayl., l. c., suggests the present lichen; but the infertile specimen, called (notwithstanding its orange color) *Lecanora gelida* by Taylor (Herb.), appears to me to belong here. Thallus at length two inches wide.

6. *LECANORA GELIDA*, *L. Ach.*—Rocks.—Thallus and cephalodia stouter than I have seen them in the northern lichen. Spores 0,015–23^{mm} long and 0,006–12^{mm} thick.

7. *L. HAGENI*, *Ach. Koerb.*—Rocks.—Several minute, lecanorine apothecia with white, crenate margins, appear to belong here, but have afforded no sufficient analysis. Taylor reckons *L. subfusca* in his list.

8. *L. MACROPHITHALMA*, *Tayl. Nyl. Urceolaria*, *Tayl. l. c.*, *Lecanora*, *Nyl. in Flora*, 1858 cit. *Krempelsh.*—Rocks.—Thallus like that of *L. gelida*, with which it agrees in possessing similar, but more depressed, cephalodia; being the third lichen thus curiously characterized in this small collection. The apothecia are externally best comparable with those of *Lecidea endochlora* (*Tayl. sub Urceolaria*), but the lichen is probably to be referred to the sect. *Aspicilia*; though spermogones have not been observed. Thalli exceeding two inches in width.

9. *URCEOLINA*, *Geng. nov.*—Apothecia urceolata, excipulo proprio albido connivente discum rubrum submarginante, margine thallino evanido. Sporæ ellipsoideæ, incolores. Spermatia acicularia, arcuata, sterigmatibus subsimplicibus. Thallus crustaceus, effiguratus.

URCEOLINA KERGUELIENSIS, *sp. nov.*—Thallo crustaceo adnato areolato-verrucoso aurantiaco-fuscescente, verrucis gibbosis centroque substipitatis in ambitum effiguratum coalescentibus; apotheciis (circ. 1^{mm}. lat.) immersis, margine proprio tenui pallido v. dein livido-nigrescente. Sporæ in thecis uniseriatis octonæ, simplices, limbatae, 0,021–30^{mm} long., 0,015–20^{mm} crass., paraphysibus filiformibus.—Rocks.—Specimen scarcely two inches in diameter. Whole habit of the pale-ash-colored young thalli that of similar thalli of *Lecanora chlorophana*; but the wart-like areoles becoming a little stalked, and the color finally making as close as possible approach, in the brown series, to dirty-orange in the lemon-colored. More or less radiation is evident in the arrangement of the warts toward the margin, which becomes lobulate, and the extreme edge blackish. Habit of apothecia that of *Urceolaria scruposa* with undeveloped thalline margin. The lichen is not referable to *Lecanora* § *Aspicilia*, and is excluded by its exciple from § *Squamaria*.

10. *CLADONIA PYXIDATA*, *L. Fr.*—On the earth.

11. *BIATORA RUBELLA*, *Ehrh. Rabenh.*—Apothecia varying no little in color and size, but all referable to the v. *inundata*, *Nyl. (Hepp. Eur. n. 289)*, as that is represented in North America. Spores 0,030–46^{mm} long and 0,0015–25^{mm} thick. Reaction of hymenial gelatine with iodine violet.

12. *LECIDEA ENTEROLEUCA*, *Fr.*—On dead grasses.
13. *L. ENDOCHLORA*, *Tayl.* sub *Urceolaria*.—Rocks. (*Herb. Tayl.*)
14. *L. FUSCO-ATRA*, *Ach.*, *Fr.*—Rocks.—And traces occur of three other *Lecidæ*.
15. *BUELLIA PARASEMA*, *Ach.*, *Koerb.*—Rocks.
16. *B. STELLULATA*, *Tayl.*, *Br.* and *Rostr.*—Rocks.
17. *B. GEOGRAPHICA*, *L.*—Rocks.
18. *SAGEDIA CHLOROTICA*, *Ach.*, *Mass.*—And there are insufficient traces of two other *Verrucarici*.

ALGÆ.

DETERMINED BY DR. W. G. FARLOW.

1. *D'URVILLÆA UTILIS*, *Bory.*
2. *D'URVILLÆA HARVEYI*, *Hook.*

Two large specimens of what seems to be this species were brought home by Dr. Kidder. In the *Flora Antartica*, the only species of *D'Urvillæa* mentioned as found in Kerguelen's Land is *D. utilis*, but, in the two specimens above mentioned, the perforations of the root correspond clearly to the description given of *D. Harveyi*.

3. *DESMARESTIA VIRIDIS*, *Lam. x.*!—Apparently very common.
4. *MACROCYSTIS PYRIFERA*, *Ag.*—Partly of the typical form, partly the var. *luxurians* of the *Flora Antartica*.
5. *ADENOCYSTIS LESSONII*, *H. & H.*
6. *SPHACELARIA FUNICULARIS*, *Mont.*?—Quite a number of specimens, too small for accurate determination, probably belong to this species.
7. *RHODOMELA GAIMARDI*, *Mont.*—A single specimen of this species was collected by Dr. Kidder. This species is new to Kerguelen's Land, the nearest recorded station being the Auckland Islands.
8. *DASYA* (*POLYSIPHONIA*, *H. & H.*) *BERKLEYI*, *Ag.*—Apparently very common.
9. *PTILONIA MAGELLANICA*, *Ag.*—Fine specimens in fruit.
10. *DELESSERIA LYALLII*, *H. & H.*
11. *NITOPHYLLUM LIVIDUM*, *H. & H.*
12. *NITOPHYLLUM FUSCO-RUBRUM*, *H. & H.*
13. *RHODYMENIA PALMATA*, *Grev.*
14. *RHODYMENIA CORALLINA*, *Grev.*—Attached to *Macrocystis* roots.
15. *RHODYMENIA VARIOLOSA*, *H. & H.*—A single specimen in fruit.
16. *GIGARTINA RADULA*, *Ag.*

17. CALLOPHYLLIS VARIEGATA, *Ag.*
18. CERAMIVM RUBRUM, *var. SECUNDATUM*, *Lyngb.*
19. BALLIA CALLITRICHIA, *Ag.*
20. CALLITHAMNION PTILOTA, *H. & H.*—New to Kerguelen's Land; previously recorded at the Crozet Islands.
21. CODIVM ADILÆRENS, *Ag.*—New to Kerguelen's Land; a not uncommon species of Europe.
22. ULVA LATISSIMA, *L.*

CROZET FLORA.

From some specimens preserved by officers of the *Monongahela*, when that ship visited Possession Island, the largest of the Crozets, on its way to Kerguelen, I have been enabled to identify the following-named plants as common to both islands:—

1. PRINGLEA ANTISCORBUTICA.—Growing much less luxuriantly than on Kerguelen Island.
 2. ACÆNA AFFINIS.
 3. AZORELLA SELAGO.
 4. GALIVM ANTARCTICUM.
 5. LEPTINELLA PLUMOSA.
 6. LOMARIA ALPINA.
 7. A moss believed to be ANDREÆA MARGINATA.
 8. Also "a small vine, with blue flowers, growing among scoriæ."
- No specimens preserved.

GEOLOGY.

The following is a list of the collection of minerals from Kerguelen Island, determined by Dr. F. M. Endlich, geologist to the Smithsonian Institution :

Smithsonian No.

9376. *Basalt*; containing decomposed *olivine* and small white crystals of *chabazite*.
9377. *Basaltic rock*.
9378. *Basaltic rock* decomposed. The red color is due to the presence of ferric sesquioxide.
9379. *Basaltic rock* decomposed. Stained by ferric sesquioxide.
9380. *Basaltic rock* decomposed. Stained by ferric sesquioxide.
9381. *Basaltic rock*, very compact.
9382. *Basalt*; containing small white crystals of *chabazite* in vesicles.
9383. *Basalt*, vesicular, with small crystals of *chabazite* and dark brown *olivine*. The red color of the portions exposed to atmospheric influences is due to decomposing *magnetite*. It contains also some *augite* in small particles.
9384. *Basalt*, slightly vesicular, containing *augite*, yellow *olivine*, and *chabazite*.
9385. *Basalt* with *olivine*.
9386. *Basalt* with large geodes of *olivine*—typical *olivine* color.
9387. Vesicular *basalt*, the vesicles being drawn out during the flow before rigidity of the material had occurred.
9388. *Chabazite* in *basalt*.
9389. *Basalt* coated with carbonate of lime, the result of the decomposition of its constituent minerals.
9390. *Basalt* with amygdules of *calcite* and crystals of *chabazite* and *augite*.

9391. *Basalt* with amygdules of *calcite* and crystals of *chabasite* and *augite*.
9392. *Calcite*, radio-columnar.
9393. *Dolerite*. A volcanic rock related to *basalt*, containing *olivine* and *labradorite*.
9394. *Aragonite*. Large radio-columnar colorless crystals found in deep pockets in *basalt*.

SUMMARY.—“The volcanic rocks of the region examined contain a limited number of zeolitic species, and some carbonates, as epigene products. The main rocks are *basalt* and *dolerite*, of uniform physical character and constancy of inclosed minerals.”

The foregoing list represents fairly the constitution of the surface-rock in the southern part of Kerguelen Island. The streams had cut their way deeply in places, exposing extensive surfaces of rock; but diligent search along these water-courses failed to disclose any stratified or fossiliferous beds. At the northern end of the island, however, in the neighborhood of Christmas Harbor, stratified rocks are abundant, with extensive deposits of coal (of poor quality), and contain many trunks of petrified trees. For a specimen of these last I am indebted to Mr. R. P. Maynard, bearer of dispatches on board the United States steamer *Monongahela*; my own observations having been confined to the neighborhood of the head of Royal Sound, at the southern end of the island.

Sealers and whalers say that there is a great glacier in the middle of the island, extending in a general easterly and westerly direction, and reaching quite to the sea on the western coast. It is related by them that a party of fourteen French sailors, from a wrecked sealing-schooner, tried several years ago to reach the southern part of the island on foot, and that all but six perished in crossing this glacier from exposure and starvation.

The island is hilly everywhere and in parts mountainous—Mount Ross reaching an altitude of over 5,000 feet, and Mount Crozier, near the American station, about 3,000. The higher peaks are remarkably sharp and irregular in outline, quite bare of vegetation, and mostly covered with snow. Table-topped hills are frequent, as also are level plateaux or terraces of basalt, projecting from the sloping sides of the less sharply defined hills. These terraces no doubt indicate former flows of the volcanic material, but our limited field of observation did not permit sufficiently extensive investigation to determine the points of outflow.

Should the islands of that region become at any time thoroughly well known, and a similar or identical feature be observed at different points, much could be learned regarding the distribution of land in that part of the world during the later Tertiary period.

Many of the hills slope smoothly up to abruptly projecting rocky crowns of basalt. Some are quite smooth in outline, without these characteristic rocky crowns. Others, running in general southwest and northeast, are long and barrow-like, and seem to have been thrown up only or chiefly by the action of the winds, which are in this part of the world remarkable for their violence. The lee (north and east) sides of the larger hills are covered by broken rocks of all sizes, irregularly heaped together; while the weather, or south and west, sides are less rocky and covered by fine gravel.

Some ranges, especially those fronting the southeast, present abrupt cliffs, intersected by broad rock-strewn plateaux. On the tops of these cliff-walls, particularly in the small gorges that notch their crests, are frequent pillar-shaped rocks, standing alone and near together, and curiously carved, as if by the action of the wind and sand. On the higher slopes it was a common thing to find bowlders of great size resting upon flat rocks, in such a position that it seemed quite impossible for them to have rolled thither. I never succeeded in finding surface-scratches indicative of former glacial action, nor would the abruptness of the physical outline of the country agree with such a supposition. It would seem that the present hills were at first lofty and irregular projections of basalt, from which fragments have continually been broken off by the violence of the winds and the action of ice. These fragments have gradually become piled up against the bases of the hills on their lee sides until the long southeasterly slopes now existing have been built up, from which the remainder of the original rock projects as a more or less rounded crown. On the weather or southwesterly sides the approach is generally more abrupt, less marked by large bowlders, and covered by small, flat gravel, through which the bed-rock frequently crops out. Possibly accumulations of snow, filling the shallower hollows in winter and sliding down the hill-sides in summer, may have their effect in moving the bowlders above referred to. Such a body of snow still existed on Mount Crozier so late as December, which had been frozen by night and thawed by day until it had become nearly solid ice, quite capable of carrying rocks of considerable size with it should it ever slide down the hill-side.

In some instances the projecting rocks have become so undermined by the action of the elements as to present very remarkable outlines. An immense mass of basalt, for example, facing northwest, some four miles from our station, seemed to be held by the strength of its material alone, so far did it overhang its center of gravity ; its base being deeply grooved and carved, as if by the action of the wind.

The streams are numerous, and furnish an excellent supply of pure, very cold water ; sufficiently pure, indeed, to be used by the photographers. Strange to say, these streams seemed to be absolutely without animal life, perhaps owing to the extreme coldness of the water (averaging 42° Fahrenheit). Ponds are frequent on both high and low land, and often of considerable size. In many places are extensive quaking bogs, and here and there are to be seen deep pits where the surface has fallen in, sometimes to the depth of 30 or 40 feet. Quicksands, or rather mud-holes, are said by the whalers to abound, and in most unexpected places. They tell many stories of shipmates who have undertaken to explore the island and have never returned, supposed to have been swallowed up in sink-holes. Persons connected with the transit parties often got upon insecure ground, but no serious accident followed in any case.

The general aspect of the island is desolate in the extreme. Snow covers all of the higher hills, against which the abrupt outlines of their dark basaltic ridges are most clearly defined. Only along the sea shore is a narrow belt of herbage, of which the singular Kerguelen cabbage is at once the largest and most conspicuous component. The weather is also extremely inclement, there being scarcely a day without snow or rain. Violent gales of wind prevail to an extent unknown in the same northern latitude. It was often impossible to go on foot any considerable distance from the home-station on account of the severity of the wind. Sir J. Clarke Ross tells of one of his men being actually blown into the sea, and of saving himself from a like accident only by lying flat on the ground. Little squalls called "woolleys" (willy-waws ?) are particularly dreaded by the sealers. A small white sphere of cloud is seen high up on the mountain-side, and immediately comes down with immense speed and violence, often burying vessels bows under. These squalls are dangerous not only by their violence but by their nearly vertical direction. In such a squall, on the 11th September, the entire transit expedition, with many officers of the *Swatara*, narrowly escaped with their lives and the loss of two boats, being overtaken while on their way from shore to the ship, anchored not more than a mile away.

Following is the monthly summary of the meteorological observations: *

United States observing station, Kerguelen Island; latitude, $49^{\circ} 21' S.$; longitude, $70^{\circ} 15' E.$; altitude of barometer above sea-level, 130 feet.

| Month. | Barometer, mean. | | | Thermometer, mean. | | | Saturation, mean percentage. | | | Wind, mean force. | Rain, total. |
|-----------------|------------------|---------|---------|--------------------|---------|---------|------------------------------|---------|---------|-------------------|--------------|
| | 8 a. m. | 2 p. m. | 8 p. m. | 8 a. m. | 2 p. m. | 8 p. m. | 8 a. m. | 2 p. m. | 8 p. m. | | |
| September * .. | 29.60 | 29.52 | 29.60 | 42.9 | 46.00 | 38.14 | ..... | ..... | ..... | 8.1 | ..... |
| October † | 29.36 | 29.32 | 29.32 | 41.97 | 41.6 | 34.00 | ..... | ..... | ..... | 5.6 | ..... |
| November ‡ .. | 29.73 | 29.74 | 29.74 | 44.9 | 50. | 41.6 | .855 | .792 | .823 | 5.3 | 2 |
| December § .. | 29.53 | 29.39 | 29.54 | 49.02 | 52.05 | 43.2 | .83 | .77 | .84 | 6.45 | 6.3 |

* Snow or rain, excepting two clear days.

‡ Twelve days without snow or rain.

† Four days without snow or rain.

§ Nine days without snow or rain.

The barometer touched its highest point, 30.30 inches, on September 16 and November 17; the wind being light on both occasions, from the southward and westward, with rain on the latter date. On October 18, the day after a severe gale, the barometer fell to 28.74, the forenoon being clear with snow in the afternoon, and the wind from the southwest. Again, on October 25, the wind being light, from the northwest, with snow all day, the barometer fell to 28.72. This also was the day after a severe gale. As a rule, we were disposed to place more reliance upon the *steadiness* of the barometer as an indicator of good weather than upon its actual height; fierce gales, snow, and rain occurring with almost every position of the mercury, but generally preceded by either a rapid rise or a rapid fall. From the 4th of December, for example, to the 9th (the day of the transit), the barometer had fallen steadily but very slowly from 29.92 to 29.12; yet the morning of the 9th dawned perfectly clear, and one of the stillest that occurred during all of our stay. The barometer began to rise about 8 o'clock, coincidently with the appearance of heavy clouds, followed by rain in the evening.

The highest thermometers recorded were 64° at 8 a. m., September 18, and 65° at 2 p. m., December 5; the wind being northwest on both occasions. The lowest recorded was 23° at 8 p. m., September 26, with a westerly wind. On one occasion, during a night early in September, the thermometer was observed to be as low as 18° , this being the lowest temperature noted. In September the extremes of temperature were 64° and 23° ; in October, 54° and 27° ; in November, $60\frac{1}{2}^{\circ}$ and $33\frac{1}{2}^{\circ}$; and in December, 65° and 35° .

* For detailed meteorological register, see report to Surgeon-General of the Navy, dated June 12, 1875; published by Bureau of Medicine and Surgery, 1876.

The force of the wind is figured on the scale usually employed on sea-going vessels, according to which the maximum is 12, representing the strongest possible wind, such as is experienced in a typhoon or hurricane. According to this scale the force of the wind was three times estimated to equal 11, and fourteen times 10, in violence. Such estimates are of course liable to a certain personal error on the part of the observer; but it is not probable that in this case the error lies on the side of excess. The average daily rain-fall for November was 0.205, and for December 0.252 inch, no rain-gauge having been set up previous to November. Both the rain and tide gauges were extemporaneous contrivances, constructed by Commander Ryan as soon as opportunity and leisure offered. By the latter the rise and fall of the tide were measured with considerable accuracy, and were found to vary from 3 feet to 7 feet, according to the season of the month, and partly to the direction and force of the wind. The average rise of the tide was about 5 feet.

MAMMALS.

The only land-mammal found on the island is the common mouse (*Mus musculus*), which abounds everywhere; doubtless imported by one of the earlier sealers. It builds its nest in holes in sand-banks (in one instance in the brain-cavity of the skull of a sea-elephant), lining it with dried grass-stems or bits of oakum. From the husks of grass-seeds scattered about the entrances to its burrows, I suppose these to be its principal food.

Upon Cat Island, one of those bounding Three Island Harbor, the wintering-place of the sealers, the domestic cat has, for many years, existed in a wild state. It lives in holes in the ground, preying upon sea-birds and their young, and is said to have developed extraordinary ferocity. Recent attempts to retame individuals, even when taken quite young, have always, as I am informed, failed. I was not able to visit Cat Island during the stay of the transit expedition, and therefore am unable to say whether any obvious structural signs of reversion were presented by these animals.

Rabbits, swine, and goats have been introduced upon the Crozet and some of the Kerguelen Islands from time to time, and have always thriven well. Hog Island, the westernmost of the Crozet group, is overrun with rabbits, which have also been introduced into Kerguelen by the English transit party.

In former years the Kerguelen group of islands was noted as a favorite breeding-place for the sea-elephant (*Macrorhinus leoninus*, L.). On this account it has been much frequented by sealers for the last forty years, and resorted to also by whalers as a wintering-place, on account of the great security of Three Island Harbor. The sea-elephants have been so recklessly killed off year after year, no precautions having been taken to secure the preservation of the species, that now they have become very rare. Only a single small schooner, the Roswell King, was working the island during our visit, two others and a bark working Heard's Island, some three hundred miles to the south, where the elephants are still found in considerable numbers. Probably they would long since have abandoned the Kerguelen Islands altogether but for a single inaccessible stretch of coast, "Bonfire Beach," where they still "haul up" every spring (October and November) and breed in considerable numbers. The beach is limited at each end by precipitous cliffs, across which it is quite impossible to transport oil in casks, nor can boats land from the sea, or vessels lie at anchor in the offing, from the fact that the beach is on the west, or windward coast, and exposed to the full violence of the wind.

No sea-elephants "hauled up" in the neighborhood of the American station previous to December. On the 13th of that month, while a boat's crew from the United States steamer Monongahela were waiting at a rocky beach for their officers, a small female of this species came out of the water and was captured and killed by them. It measured in length 8 feet 10 inches, and in girth 8 feet 4 inches, being enormously fat. The layer of fat beneath the skin was 4 inches deep, and the body seemed almost formless; a skin stuffed with semi-fluid fat, that quivered and trembled, when moved, like jelly. The skin was prepared and preserved, and the skeleton partly cleaned and sunk in a barrel for small crustaceans to work on. Most unfortunately, during a very severe gale about Christmas time, it was carried away by the violence of the sea and lost. Two other skins and skeletons were procured for me by captains of sealers, one of which, a fine full-grown bull from Heard's Island, said to have measured 23 feet in length, was also lost, along with fifty barrels of oil, while being rafted off to the schooner. The other, a small and immature specimen, came from the eastern Kerguelen coast, and has been brought home in safety. It was procured for me by Captain Fuller, of the schooner Roswell King. (See Nos. 15336 and 12455 National Museum Catalogue.) The dentition of this specimen is complete, but the

ossific centra of many bones, notably of the vertebræ, have not yet become united together. Prof. Theo. Gill has examined and identified the skeleton, which, with two skins, constitutes the collection of this species finally preserved.

The sea-elephant begins to "haul up" on the beaches of its breeding-places about October 10, and remains ashore until well into the month of January. The old bulls, which alone are provided with a proboscis, take charge, each, of a large number of females, guarding them from the approach of other bulls, and (so the sealers assert) prevent them from returning to the sea before the young are old enough to do so with safety. During the breeding-season the bulls are very pugnacious, fighting fiercely with each other, and even attacking the sealers themselves. Although seemingly so unwieldy, they are described as getting over the beaches with surprising speed, advancing both flippers at a time and using them like crutches. The beaches of Royal Sound are fringed by innumerable wallows—cradle-shaped pits—in which the animals lie during the breeding-season, recalling the buffalo-wallows of our western prairies.

The increasing scarcity of the sea-elephant, and consequent uncertainty in hunting it, together with the diminished demand for the oil since the introduction of coal-oil into general use, have caused a great falling-off in the business of elephant-hunting. The Crozet Islands, for example, had not been "worked" for five years, and at Kerguelen there was only one small schooner engaged in this pursuit, two others making Three Island Harbor their headquarters, but spending the "season" at Heard's Island, three hundred miles to the southward. It may, therefore, be reasonably hoped that these singular animals, but lately far on the way toward extinction, will have an opportunity to increase again in numbers, and that the sealers may learn from past experience to carry on their hunting operations with more judgment, sparing breeding females and very young cubs. When the *Monongahela* visited the Crozet Islands on December 1, they found the sea-elephant very numerous, although left undisturbed for only five seasons.

Besides the sea-elephant the sea-leopard, (*Ogmorhinus** *leptonyx*, Blainv.) often visits the island, as do several species of seal. The sea-leopard is also sought for its oil, but is less valuable, being a much more

*This name is substituted for *Stenorhynchus*, because the latter has already been ascribed to other animals: to a crab in 1819, and to an insect in 1823 and 1825. See W. Peters in *Monatsbericht der Königlich Preussischen Akademie der Wissenschaften zu Berlin*, June, 1875.

active animal, and therefore less heavily loaded with blubber. The king-penguin is said to be its favorite food, a statement which speaks well for the sea-leopard's activity in the water, the penguin swimming rapidly enough of course to catch the fish upon which it feeds. The leopard is described as pursuing and overtaking the penguin under water, rising to the surface and tossing it into the air, so as to catch it more securely, crosswise, in its jaws.

Dr. W. Peters also describes a new species of *Otaria*,* the *Arctophoca gazella*, its specific name being given in honor of the sloop of war *Gazelle*, which carried the German transit of Venus expedition to Kerguelen Island. And Rev. Mr. Eaton, naturalist to the English expedition, speaks of two "species of platyrrhine seal",† in addition to the sea-elephant and sea-leopard. By our own party only four individuals of the *Phocidæ* were seen during four months' residence on the island. Two of these were thought to be sea-leopards, and two sea-elephants, one of the latter having been captured and preserved, as above stated. Sealers speak of a few scattering fur-seals upon this and Heard's Islands, but they have never been found in large numbers.

Many species of whales and porpoises abound in the neighboring seas. In the early days of whaling in the Indian Ocean, these islands are said to have literally swarmed with whales, for which the numerous inlets and bays of the archipelago furnished secure and sheltered breeding-places. Even now this region is one of the best whale-fishing grounds of the Antarctic Seas.

FISH.

(IDENTIFIED BY PROF. THEO. GILL.)

Very few fish were collected, owing to the want of boats. Several attempts were made with set-lines from the shore, but without success. From the deck of the *Swatara*, September 9, was caught, with a hand-line, a fine specimen of *Chæniethys rhinoceratus*, Richardson, which has been preserved. (Catalogue National Museum, No. 16642.)

There were also captured, at various times, under stones on the beach, at low water, small specimens of *Notothenia purpuriceps*, Rich., and *Harpagifer bispinis*, Rich. On the 2d January, dredging at 5 fathoms from the steam-entter of the *Monongahela*, I obtained two small speci-

* Loc. cit.

† Annals and Magazine, October, 1875.

mens, one of which proves to be *Notothenia purpuriceps*, and the other (probably) *Notothenia tessellata*, Rich., hitherto reported from the Falkland Islands. Some of the dorsal rays having been injured in transportation, the diagnosis is not positive.*

The sealers reported that at times they had caught a fish of considerable size, "like a tom cod", at the outer edges of the kelp-beds; but state that fish are never very plentiful. None were found in the fresh-water streams.

A single specimen each of a species of *Gobiesox* and *Clinus* was brought from Table Bay, South Africa, having been captured on the shore.

MOLLUSKS.

BY W. H. DALL, SMITHSONIAN INSTITUTION.

CEPHALOPODA.

Octopus?

Beaks of a cephalopod, perhaps an *Octopus*, were discovered by Dr. Kidder in the stomachs of sea-birds. Also an *Octopus*, dead on the beach, after a storm, in too imperfect a condition for identification.

GASTEROPODA.

RISSOIDÆ.

GENUS EATONIELLA, Dall.

Eatonia, E. A. Smith, Ann. Mag. N. Hist. xvi, ser. iv, July, 1875, 70; (not *Eatonia*, Jas. Hall, 10th Rep. N. Y. State Univ. 90, 1857; Pal. N. Y. iii, 432, 1858.)

The name *Eatonia* being pre-occupied, as above, by Hall for a genus of brachiopods, I have substituted a modified form of it which does not appear to have been used. This genus is practically a thin, smooth *Rissoina*, as far as the shell goes, apparently bearing much the same relation to *Rissoina* that *Cingula* does to *Rissoa*.

EATONIELLA KERGUELENENSIS.

Eatonia kerguelensis, E. A. Smith, l. c. 70.

Mus. No. 11898.

The specimens, five in number, collected by Dr. Kidder at low-water

* Gill, Synops. Notothenioids, Proc. Phil. Acad. Nat. Sci. 1861, 591.—Richardson, Ichthyology of the Erebus and Terror, 5.—Günther, Cat. Acanth. Fishes, ii, 260.

mark on fuci, show such great variations in form of aperture, acuteness of the spire, and general proportions, that I am unwilling to describe them as new, though the diagnosis of Mr. Smith does not seem in all respects applicable to them. None of them exceed four and a half whorls in extent, the aperture being nearly one-half as long as the shell. A faint umbilical chink is perceptible in a greatly enlarged camera-drawing. The largest specimen is 4.5^{mm}. in length and 2.3^{mm}. in width. If, on comparison, the specimens should be found to differ from the form described by Mr. Smith, they may be called *Eatoniella inflata*.

The operculum of this species, besides being subspiral instead of concentric, differs from that of *Rissoella* Gray (= *Jeffreysia*, Alder) in having the process extended at a much more obtuse angle, but on the same side of the operculum.

EATONIELLA CALIGINOSA.

Eatonia caliginosa, E. A. Smith, l. c. 71.

Mus. No. 11899.

Two specimens, apparently of this species, were obtained by Dr. Kidder.

MURICIDÆ.

PURPURA STRIATA.

Buccinum striatum, Martyn, Un. Conch.

Mus. No. 11900.

New Zealand, Martyn; Kerguelen, Dr. Kidder, two specimens, one living; probably this species, which is common in New Zealand.

PATELLIDÆ.

PATINELLA MAGELLANICA.

Patinella magellanica, Dall, Am. Jour. Conch. vi, 273, 1871.

Patella magellanica, Gmelin.

Patella deaurata, Auct.

Patella ferruginea, Wood, Index Test. No. 22.

Patella fusca, Dillwyn, Cat. ii, 1047, No. 70.

Mus. No. 11901.

Straits of Magellan, United States Exploring Expedition; Kerguelen, dead on beach, seven specimens, much worn, Dr. Kidder.

PATELLA? DELESSERTII, Philippi.

Mus. No. 11902.

Straits of Magellan, authors; Kerguelen, one dead specimen probably of this species, Dr. Kidder.

CHITONIDÆ.

GENUS HEMIARTHURUM, Cpr., MS.

Valvæ terminales laminatæ, haud articulatæ, laminæ laterales obsoletæ; zona lanuginosa, porifera; branchiæ posticæ.

HEMIARTHURUM SETULOSUM, Cpr., n. s.

Mus. No. 11903.

H. t. latiore, curvata, olivaceo-fusca; jugo planato; mucrone sub-centrali? areis haud definitis; totâ superficie sensim quincunxiter granulosa, granis satis extantibus.

Intus; valva anticâ et posticâ conspiciue laminata; laminis acutis, haud incis, haud regularibus, valde extantibus; subgrundis spongiosis, minimis; valvis centralibus et posticâ laminis suturalibus, triangularibus, maxime distantibus, extantibus, decliviter lateraliter, continuis; sinu maximo, valde spongioso.

Zona modicâ, haud expansâ, solida, leve; sparsim minutissime lanuginatâ; poris minutissimis, setuliferis ad suturas, et circ. iv, circum valvas terminales sitis, instructâ, setulis minimis, curtissimis.

Animal, pede capiteque normalibus; branchiis majoribus posticis, utroque latere circiter vi, medio pede tenuis. *Lon.* 13^{mm}. *Lat.* 7^{mm}. *Div.* variante ad 130°.

Kerguelen Island, on stones at low water, Dr. Kidder, two specimens.

This shell, externally, resembles some of the coarse, ill-defined acanthochitons. The girdle, however, is narrower and smoother than in that genus, and the pores so extremely minute that in a dry specimen they would escape attention. Within, however, the features are entirely new, though not unexpected. It forms a transition between *Hanleia* (*mendicaria*) and the articulate chitons. A single unsplit lamina surrounds both the terminal valves, projecting far beyond the external layer. In the posterior plate this is continued forward to form part of the sutural laminæ. These, in all the valves, slope off, both toward the middle and toward the sides, so as to take the place of the ordinary side-laminæ, which here do not exist.

The specimen examined—hardened by preservation in alcohol and

softened in water only—had the plates so much affected by the decortication of the whole jugular portion that I was unable to extract them in a perfect condition. However, all the characters could be made out except the *muco*, which, judging by the remaining striæ of growth, must have been central, or nearly so. (Carpenter MS.)

HELICIDÆ.

HELIX (HYALINA) HOOKERI.

Helix hookeri, Pfr. Mon. Hel. iii, 88, No. 531.

Helix hookeri, Reeve, Conch. Icon. 208, n. 1474.

Mus. No. 11904.

Kerguelen Island, Hooker, Dr. Kidder. Gregarious about and under stones. Occasionally the shell of this species appears to be partly membranous, and in drying, from this cause, the spire is frequently abnormally flattened.

SIPHONARIIDÆ.

SIPHONARIA TRISTENSIS.

Siphonaria tristensis, Sby. Gen. Sh. f. 3.; Dall. Am. Journ. Conch. vi, 1870.

Siphonaria lessoni, Blainv. teste Rve. Ic. v., fig. 23, a, 6.

Mus. No. 11905.

Tristan d'Acunha, Rve. Orange Harbor, Patagonia, United States Exploring Expedition; Kerguelen, Dr. Kidder; abundant between tide-marks.

ACEPHALA.

LASEIDÆ.

LASEA RUBRA, Mont.

Mus. No. 11906.

Kerguelen Island, Dr. Kidder, four specimens; with mussels. Distribution world-wide. These individuals are rather larger than most northern specimens.

LEPTONIDÆ.

LEPTON PARASITICUM, n. s.

Mus. No. 11907.

Shell small, elongate ovate, inflated, thin; beaks nearly central, not prominent, surface shining, but not polished, with the texture of a *Pandora*. Shell white, hardly sculptured, but under a high magnifying

power showing delicate concentric lines and fine radiating, apparently pubescent, lines extending from the umbones. Margins of the shell covered by an extension of the mantle, provided on each side with seven or eight stout cirri or tentacular processes. A single larger cirrus above the foot at the anterior end. Siphon short, foot small, very close to the anterior end of the shell.

Length, 2 mm; height, 1.6 mm.

Habitat, in the channels leading to the oral aperture of a species of echinoid (*Tripylus*), where it appears to lead a parasitic or at least a commensal existence. These echini were dredged by Dr. Kidder at Royal Sound, Kerguelen Island, near the station of the United States observers, in five and twelve fathoms. These tiny mollusks were quite abundant on the particular portion of the echinus mentioned, but none were found on any other part. It would seem as if the soft parts, before becoming contracted by the alcohol, must have almost entirely enveloped the shell. The latter was of such extreme tenuity that all efforts to remove it entire from the specimens resulted in its destruction. The teeth appeared, however, to resemble those of the other species of the genus; none of which, so far as I can recall, have been reported as commensal animals.

MODIOLARCIDÆ.

KIDDERIA, n. g.

Shell minute, byssiferous, concentrically sculptured, with two minute cardinal teeth in each valve, and a partially internal ligament attached to a more or less prominent process on the inner hinge-margin of each valve. Pallial line simple.

KIDDERIA MINUTA, n. s.

Mus. No. 11908.

Shell minute, thin, inflated; shaped not unlike a short *Lithodomus*; the upper posterior surface dark rose-color, the basal and umbonal portions of the valves whitish, with an excessively thin epidermis; the interior more or less suffused with rose-color, smooth, but not polished. Muscular scars indistinct, anterior scar rounded, posterior ovate. Umbones rounded, inflated, nearly terminal; anterior end of shell subtruncate, posterior end rounded. Surface smooth, under a high power showing minute rounded incremental concentric ridges. Cardinal teeth very minute, anterior largest, hinge-margin not thickened except at the ligamentary processes. Ligament strong and thick, attached almost exclu-

sively to the inner side of the hinge-margin, but partly visible from the outside between the edges of the valves.

Length of largest specimen, 4^{mm}; height, 3^{mm}; diameter, 2.5^{mm}.

This minute shell was found attached to the byssus of *Mytilus canaliculus*, and at first sight might be readily taken for the fry of that species. An examination of the hinge and muscular scars, however, is sufficient to dispel this impression.

It differs from *Modiolarca*, in its single anterior muscular scar, the presence of strong *nymphæ* for the subinternal ligament, and in the full development of the cardinal teeth; which, though minute, stand sharply out from under the cardinal border, instead of being subobsolete upon its internal face. The ligament falls little short of being entirely internal. So strong, and so strongly attached is it, that all attempts to clear it from the hinge-processes were ineffectual, and their exact shape (which appears to differ slightly in different individuals) could not be made out. In fact, in opening the shell, the valves would usually give way before the ligament. Its attachments appear to be entirely internal, though the edges of the valves do not quite close over its outer surface. The margin of the shell appears perfectly plain, and most of the specimens possess a slender byssus.

Modiolarca pusilla, Gould, appears (from the type specimens) to belong to this group, but it differs from *K. minuta* in form, color, and larger proportional size of the teeth. Gould's figure does not well represent his typical specimens. They were from Tierra del Fuego, and among some *minutæ* from Orange Harbor, collected by the United States Exploring Expedition, I found several specimens of *K. minuta*. In some respects this shell recalls *Ceropsis* of the *Carditidæ*.

I am pleased to be able to connect with this interesting little form the name of Dr. Kidder, who has, with very limited opportunities and the disadvantage of a comparatively short stay on the island, succeeded in accumulating a most interesting fund of specimens and biographical notes.

MYTILIDÆ.

MYTILUS MAGELLANICUS, Chemn.

Mus. No. 11909.

New Zealand, Straits of Magellan, authors; Kerguelen Island, Dr. Kidder; four living specimens, much eroded, and numerous dead valves.

MYTILUS CANALICULUS, Hanley.

Mytilus latus, auct. non. Lam.

Mytilus unguatus, Rve. Conch. Ic. ii, 4.

Mus. No. 11910.

Chili, Reeve; New Zealand, Hanley; Kerguelen Island, Dr. Kidder, living; abundant. The shell of this species closely resembles some varieties of *Mytilus edulis*, but the soft parts are quite different. The foot is large and quite flat beneath. The viscera and branchiæ are white; the foot and mantle edge streaked with dark brown.

The following species, not obtained by Dr. Kidder, but described as new, by Mr. Smith, in the paper referred to; and other previously-described species, which are not enumerated in the paper in the Annals, were found by the Rev. A. E. Eaton, of the English party at Kerguelen.

Struthiolaria mirabilis, Smith.

Buccinopsis (?) eatoni, Smith.

Trophon albolabrat, Smith.

Littorina setosa, Smith.

Rissoa Kergueleni, Smith.

Eatoniella subrufescens, Smith, sp.

Skenca subcanaliculata, Smith.

Scissurella supraplicata, Smith.

Solenella gigantea, Smith.

Yoldia subæquilateralis, Smith.

[In addition to the foregoing, the collection contains individuals of an undetermined *Doris*, found in tide-pools, at low-water.—J. H. K.]

MOLLUSCOIDA.

The class TUNICATA is numerous represented, both solitary and compound ascidians being abundant upon rocky beaches and attached to the great masses of kelp (*Macrocystis*) which fringe the shores of the island. A large solitary ascidian, of dark mahogany color, with tough, leathery envelope, was especially common just below low-water mark. Specimens were found as long as 5 inches.

Flustra and numerous other forms of POLYZOA grow luxuriantly upon the stems and leaves of sea-weed, presenting often remarkably

delicate and beautifully branching forms. No brachiopods were collected, owing, I suppose, to the want of facilities for dredging, since better-known regions in the same latitude have been found to be particularly rich in animals of this class. None of the *Molluscoida* have yet been identified specifically.

INSECTS.

COLEOPTERA.

Several species of *eureulio*, and a very few specimens of a small black beetle, were found at different times and in very diverse localities. The little black beetles were caught on rocks near the sea and about the roots of wet tufts of moss. They belong to the genus *Oethebius*, Leach, a member of the aquatic family *Helophoridae*, McLeay, and are vegetable feeders in the perfect state. The British species are described as slow in their movements, creeping along the stems of aquatic plants, and often crawling out of the water upon the margins of fresh-water pools. There was no body of fresh water near the habitat of these Kerguelen specimens, but the herbage in which they were found is constantly drenched with rain and snow water. Westwood states (Guide to the Classification of Insects, London, 1839) that "this family appears to be confined to temperate climates, no species having been hitherto found as inhabitants of tropical countries, or, indeed, as belonging to the southern hemisphere."

A small black species of *eureulio* was captured near the top of Mount Crozier, above the snow-line, early in the summer (November). It had just crawled out of a tuft of moss upon the surface of a rock. Other similar specimens had been found still earlier in the season under stones in gravelly soil, apparently torpid. Later, many different forms, some of moderate size, were found on the sunny faces of rocks near the sea. Many of these were colored green, blue, or brown, but the colors were generally dull. Most of the species were incapable of flight, their wing-cases being soldered together. Some of the largest forms were good fliers, however; the largest and most brilliantly colored specimen taken having flown into my hut one night, attracted by the light. These *eureulios* were not observed to counterfeit death when approached, as is the habit of the family elsewhere. All of these various forms are pronounced by Professor Gerstaecker (to whom both these and the preceding were sent for identification) to belong to the genus *Phyllotobius*,

Schönherr, the specimens being too much injured in transportation to admit of the determination of the species. The few drops of carbolic acid, added to the bottle of glycerine, alcohol, and water, in which they were preserved, seem to have been destructive to the more minute parts.

Besides the foregoing, a single specimen of a small brown beetle, supposed to be an elater, was captured and preserved, but has somehow been lost in transportation. Mr. Eaton speaks of finding longicorn beetles, and "several species of *Brachyelytra*." (Ann. and Mag. Nat. History, Oct., 1875, p. 291.)*

It is somewhat remarkable that the prominent form in the *Colcoptera* of Kerguelen, an island destitute of trees and shrubs, should be the curculio, and that the only other form collected by our party should be a water-beetle, living at a distance from any pond or pool. The possibility of importation by the whalers, which have so long frequented the island, should be borne in mind in this connection.

LEPIDOPTERA.

The small vial containing the collection of *Lepidoptera* has been lost in transportation. A single flying tineid moth was observed soon after our landing, but supposed to be a clothes-moth from our own boxes. While preparing some botanical specimens for the press on the evening of December 18, I captured two lepidopterous insects of moderate size, with very imperfect and abbreviated wings, active in their movements, and "seeming to be provided with two pairs of antennæ, one being long and thread-like, the other shorter, pectinate, and curling backward over the top of the head." These insects are noted in my diary as "*Podura*—

* The following species from Mr. Eaton's collection have been described by Mr. Chas. O. Waterhouse, in the Entomologists' Monthly Magazine (London, Aug., 1875, 54), as from Kerguelen's Land:

SUB-ORDER BRACHYELYTRA:

FAMILY, ALEOCHARIDÆ:

Phytosus atriceps, sp. nov.

SUB-ORDER RHYNCHOPHORA:

FAMILY, BRACHYDERIDINÆ:

Canonopsis sericeus, gen. et sp. nov.

Agonelytra, gen. nov.

Agonelytra angusticollis, sp. nov.

Agonelytra gracilipes, sp. nov.

Agonelytra brevis, sp. nov.

like moths of large size, with partly-developed wings, from the roots of plants." Small *Poduræ* were not uncommon. With these exceptions, no members of this order were observed during our stay, although often sought for, particularly at night.*

DIPTERA.

FAM. ACALYPTERA.

(IDENTIFIED BY C. R. OSTEN SACKEN.)

Calycopteryx mosleyi, Eaton, g. and sp. nov.;

Anatalanta aptera, Eaton, g. and sp. nov.;

Amalopteryx maritima, Eaton, g. and sp. nov.—Entom. Mag., Aug., 1875.

Early in November, the first species named above was found on the leaves of the Kerguelen cabbage (*Pringlea antiscorbutica*), and thereafter in increasing numbers. The insects are of considerable size, dark brown in color, with long legs, and considerable activity of movement, looking not unlike large ants. This species is distinguished on superficial examination by its long ovipositor, and by the prominent pubescence covering its abdomen. Upon the approach of the observer the insects drop from the leaves in great numbers, doubling up their legs and counterfeiting death. As the axils of these large leaves always contain a considerable quantity of water, the utility of the pubescence with which the insects are covered becomes very apparent, protecting them from getting wet by the film of air entangled in the hairs. Footless larvæ, supposed to belong to these insects, were found in abundance among the damp roots of moss and grass.

On the 27th of November, I set a jar with its rim even with the surface of the earth and baited it with carrion in the hope of catching beetles. It contained, in the morning, large numbers of *Diptera* of the second species (*Anatalanta aptera*), differing superficially from the preceding by their lesser size, darker color, less pubescence, and much less distinct ovipositors. They were also much more active in their movements, and almost always found upon dead animal matter. They were not observed to counterfeit death on being approached.

It was not until late in December that the third species was discovered on wet rocks at the edge of the sea. These are smaller than either of the others, quite black, not visibly pubescent, and provided

* Mr. Eaton describes only the tineid moth, viz: *Embryonopsis halticella*, gen. et sp. nov. Ent. Mag., loc. cit.

with small, triangular rudiments of wings. They cannot fly, but seem to use the wings in jumping, which they do with great activity, making it quite difficult to catch them. They do not appear to jump in any definite direction, but spring into the air, buzzing the small winglets with great activity, and seem to trust to chance for a spot on which to alight, tumbling over and over in the air. I never observed them jumping when undisturbed.

These three genera of wingless flies present several anomalies not heretofore observed. With the structure of flies, they possess many of the habits of beetles, such as that of counterfeiting death when in danger, and seem to represent this order in the economy of the locality. The carrion-feeder (*Anatalanta aptera*) has no vestige of either wings or balancers (halteres), "*Aptera anhalterata*," Mr. Eaton calls them. The leaf-feeders show small scale-like bodies, which Mr. Eaton supposed to represent the balancers ("*halteribus brevibus et parvis*"). Baron Osten Sacken, however, finds that these scales are really representatives of the wings. The third genus (*Amalopteryx maritima*) represents a further step in the progress of development, possessing both wings and balancers, but still unable to fly. A small gnat, observed only during the time of flowering of the "Kerguelen tea" (*Acæna affinis*, Hook. fil.), was the only flying insect observed by me while on the island. Even the common house-fly had not yet been naturalized. Mr. Eaton mentions also a species of *Tipulidæ*,* with imperfect or abortive wings.

PSEUDO-NEUROPTERA.

BY H. A. HAGEN.

RHYOPSOCUS ECLIPTICUS.

Head large, triangular, scarcely longer than broad, flattened above; occipital margin straight, very little notched in the middle. Eyes black, scarcely prominent, placed in the hind angle of the head; half as long as the head, half as broad as long, slightly rounded externally, with very large facets, only 15 along the external margin; ocelli wanting (Note 1). Nasus large, tumid, nearly straight before, the angles rounded; labrum half as long as broad, front margin straight, angles rounded; antennæ inserted between the base of the clypeus and the eyes, long, nearly as long as the body, thin, 26-jointed; the two basal joints much larger, of equal length, cylindrical; the six following ones nearly equal, cylindrical, a little shorter than the second one; the eight following ones a little shorter, somewhat ovoid; the last of them (the 16th) a

* Described as *Halgritus amphibius*, Eaton, Entom. Mag., Aug., 1875.

little shorter and more dilated; the following ten cylindrical, a little longer, except the shorter terminal one. Fine hairs are inserted around the joints, sometimes two on each side, sometimes more—up to four or six. In the basal part of the antennæ the hairs are longer (Note 2). Mouth-parts strong; mandibulæ hooked, the base interiorly dilated and denticulated; maxillæ with an elongated interior lobe, with two series of teeth at the base; the long horny stem straight, bifid on tip, exterior branch a little longer; maxillar palpus 4-jointed, large, last joint longer, hatchet-shaped, with numerous hairs in small holes on the apical margin; labium with two triangular inner lobes, and 2-jointed palpæ, the first very short, the last large, similar to the last joint of the maxillary ones, but smaller. Prothorax more than half as broad as the head; the hind angles protracted into triangular lobes. Mesothorax and metathorax not very distinct, seemingly as broad as the prothorax, side lobes more rounded.

Fore wings shorter than the abdomen, three times longer than broad, rounded on tips, anterior margins in a very flat curve, posterior nearly straight; base of the wing a little narrower than the tip, rounded posteriorly. The whole margin around the wing is bordered by a strong vein, thickly beset with oblique darker stripes or tubercles; and at larger intervals with longer stiff hairs, set in holes, mostly on the veins, some near by in the membranous part of the wings. One middle vein is soon furcated beyond the base into a superior and an inferior branch. The superior branch provides the anterior half of the wing; it is furcated very soon again, the two branches running parallel and uniting at about the middle of the length of the wing by an oblique vein. From the upper end of this oblique vein goes a short branch straight to the anterior margin of the wing, and two longer ones to its rounded apex, the inferior of them again furcated at about its middle; from the inferior end of the oblique vein goes one branch, furcated half-way to the inferior part of the wing-apex; the inferior branch of the two last ones is, in the other wing, furcated again a short distance from the margin. The inferior branch of the furcation just beyond the base of the wing is again furcated just before the middle of the wing, and its superior branch again; so it goes, somewhat incurved, with three veins, to the apical half of the hinder margin. There go one (or two) straight veins from the basis in an oblique line to the basal half of the posterior margin. I am not sure whether a short oblique vein goes from the basis to the anterior margin. The right wing is more irregular, and it seems that

the inferior branch, distributed to the apical half of the hinder margin, comes from the superior one, somewhat in front of the oblique vein, and that its two inferior branches are derived, as in the other wing, from the basis. All veins are beset at intervals with stiff hairs, like the marginal vein.

The hind wings are similar in shape to the fore wings, but shorter and narrower. The surrounding marginal vein similar but not so strong. There are none of the long hairs in the hind wing. A middle vein gives off in the first third an oblique branch to the hind margin. This is the only vein in the hind wings reaching the marginal vein. All others cease more or less abruptly before reaching them. Shortly after a similar oblique vein goes to the anterior margin. In the middle of the length of the wing the main vein is branched, and gives a long inferior branch going to the hind margin near the tip without reaching it; then, the superior branch furcates in two parallel branches going to the tip; the inferior one shows posteriorly an indication of the beginning of a branch.

Legs long, stout, the posterior longer than the abdomen; femurs stout and thick (perhaps the species jumps like many *Psocidæ*); tibia cylindrical, as long as the femur, slightly hairy, with two movable spines on the apex below; tarsi 3-jointed, one-third shorter than the tibia, cylindrical, the last joint long, the two others equal, and together two-thirds of the length of the basal joint; at the apex of the last joint two claws, thicker at their bases, the apex fine, a little bent at tip; between the claws a rounded plantula.

Abdomen ovoid, more pointed toward the apex. The egg-valves very clearly visible (the specimen is a female); two exterior membranous, elongated lobes, two horny interior stems, long, narrow, perhaps articulated; the apical part bent inward, and the tip again outward; between the two horny ones are two smaller elongated, pointed, horner stems, much shorter than the others.

The color is pale brownish-yellow, darker on head and mandibles; antennæ grayish; wings hyaline, colorless, the long hairs of the forewings dark.

Length of the body a little less than 2 millimeters; expanse of fore wing $1\frac{1}{2}$ millimeters. Locality Kerguelen Island, October, 1874.*

* The only specimen noticed during the stay of the Transit Party at Kerguelen was captured October 17, within doors, and was mounted in balsam upon a microscopic slide. Shortly before its capture some instrument-boxes, brought from Washington and containing a quantity of packing-straw, had been unpacked in the same room; a circumstance rendering the habitat of the insect very doubtful at the time.—J. H. K.

The specimen belongs, doubtless, to the so-called micropterous forms of *Psocidæ*, which occur occasionally and are observed in many species. Mr. Westwood has founded upon such specimens the genus *Lachesis* proved by McLachlan to be, probably, a micropterous condition of *Oecilius pedicularius*. In the Kerguelen specimen the shortness of the wings (the fore wings are shorter than the body), and the reticulation not identical in both wings, show an aborted condition. The systematic place is rather doubtful.

Within the section of *Psocidæ* with ocelli (I have stated that I believe the Kerguelen specimen to be *without* ocelli) two genera have legs with 3-jointed tarsi. But in both (*Myopsocus* and *Elipsocus*) the second joint is much shorter than the third, and the antennæ only 13-jointed. Of the species described for those genera *E. pusillus* from New York is not very much larger, and is similar in colors. But the reticulation is very different and ocelli are present. In my two specimens the antennæ and tarsi are broken.

Among the *Psocidæ* without ocelli only *Psoquilla* could be taken into account. The tarsi are of the same shape, the palpi also; the antennæ are equally multiarticulate, but *Psoquilla* possesses no hind wings, and the reticulation is scarcely related. I should add that *Psoquilla* is known only by three specimens of uncertain locality, and not in good condition.

The genus *Psyllipsocus*, founded by Baron De Selys Longchamps on *Psocus pedicularius* Rambur, approaches this species more nearly in regard to the reticulation of the fore-wings, and has 3-jointed tarsi, but nothing is stated about their length, or about the presence of ocelli, or the number of joints of the antennæ. The single specimen, in bad condition, is perhaps also exotic, that is, imported into Paris with plants or merchandise.

Therefore the specimen, not agreeing with any known species or genus, must belong to a new genus, which I name *Rhyopsocus*. The character of the genus would be sufficiently established; *ocellis nullis; antennis 26-articulatis palpis maxillaribus articulo apicali magno, truncato; tarsis triarticulatis, articulis duobus apicalibus æqualibus; alis quatuor*.

The question whether the species is introduced from America, is not to be answered with certainty. All species hitherto known from America differ from one another. The only species I have not seen is *P. pusillus* Harris, but the description differs. Now it is certain that not more than ten per cent. of the species living in North America are known, probably even less.

The introduction of the Psocidæ into foreign countries is very easy. Two species, living in Ceylon upon the coffee-tree, have been collected near Rio de Janeiro by Mr. B. P. Mann, on the coffee-trees introduced long ago from Ceylon. Perhaps they are also introduced in Ceylon. *Atropos oleagina* occurred in Ceylon, and was stated to have been imported with oil-cake from England; but there is no evidence that the species is British. Other species of *Atropos* and *Psocus* occur in many parts of the world. The curious instance that *R. eclipticus* has aborted wings, like most of the Kerguelen insects, would in this case not be a certain proof for the habitat. But it is certainly not impossible.

NOTES.

NOTE 1.—As the presence or the absence of the ocelli is a very important character, I have spent a considerable time in examining those organs. I confess that there are still some doubts about this matter. In the middle of the head, and in the same direction with the upper ends of the eyes, is a transverse air-bubble, or better, a hole filled with air, assuming the shape of the cerebrum, narrower toward the middle from behind, rounded at the end. But the two sides differ in shape. The left side is cylindrical, rounded at the outer end, with a cup like a watch-glass, imitating well the cornea of an ocellum; the right side has a similar shape, but the outer end is in some way extravasated, beginning from the place where on the left side the cornea-like cup begins. The place filled with the extravasation is represented on the left side by a hollow space, to be seen well marked in the interior of the head. A third anterior ocellus is entirely wanting, although the parts are all quite visible, and I see two little prominences which would represent the beginning of the two nervous commissures encircling the œsophagus. Though the whole interior of the body is transparent, and the digestive organs are quite visible, I cannot distinguish anything belonging to the nervous system, not even the ganglia; probably they are too transparent. After all, I consider the above transparent, transversal organ to be the cerebrum, and the ocelli as wanting, the more so since the Psocidæ known have either three ocelli or none, but never two. And even here, if the two posterior ocelli only were represented, they are much more separated from each other than in any species hitherto known.*

NOTE 2.—The antennæ were broken; on one side only eight joints remained, on the other, twelve; but lying near by was the apical part of

* So large a number of joints in the antennæ is only to be found in species without ocelli.

fourteen joints. The joints are covered with numerous fine pores; but commonly one much larger pore on each side, below the middle, is very conspicuous in the middle joints of the antennæ, principally in the sixteenth and preceding joints. Such a large pore contains the insertion of a sensitive hair.

No other order of insect proper seems to be represented on Kerguelen Island than those already mentioned. Neither was any member of the class *Myriapoda* observed. Spiders of the wandering sort are abundant, their tents being numerous under almost every large stone. There are no web-builders, however, and, although individuals are numerous, the variety in form is slight. The collection has been sent to Mr. William Holden, of Marietta, Ohio, for identification.

A small red acarinus was very plentiful upon the leaf-stalks of the Kerguelen cabbage, and, indeed, wherever succulent vegetation was luxuriant. Broad yellow bands, observed on the sides of rocks frequented by cormorants, were found to consist almost entirely of another variety of acarinus, yellow in color, and spotted on the back, somewhat like the "lady-bird" (*Coccinella*).

CRUSTACEANS.

DESCRIBED BY S. I. SMITH.

DECAPODA.

PINNOTHERIDÆ.

HALICARCINUS PLANATUS, White.

Cancer planatus, J. C. Fabricius, *Entomologia Systematica*, ii, 446, 1793.

Leucosiâ planata, J. C. Fabricius, *Supplementum Entomologiæ Systematicæ*, 350, 1793.

Hymenosoma tridentatum, Lucas, in Hombron et Jacquinot, *Voyage de l'Astrolabe au pôle sud*, 60, pl. 5, figs. 27-33.

Halicarcinus planatus, White, *Annals and Magazine Nat. Hist.*, vol. xvii, 178, 1846, pl. 2, fig. 1; *Catalogue Crust. British Museum*, 33, 1847.—Dana, *United States Exploring Expedition*, *Crust.*, 385, pl. 24, fig. 7, 1852.—Edwards, *Annales des Sciences naturelles*, 3me série, xx, 1853, 223.—Heller, *Reise der österreichischen Fregatte Novara um die Erde*, *Crust.*, 66, 1865.

Specimens of this species were collected at Kerguelen Island, on rocky beaches, and others were dredged in five fathoms. It was previously known from Tierra del Fuego and New Zealand. The males are nearly equal in size to the females, and have very much stouter chelipeds.

AMPHIPODA.

ORCHESTIDÆ.

HYALE VILLOSA, Smith, s. n.

Of this species there is in the collection only a single somewhat mutilated specimen, from which the following description is taken :

Male : Second and third segments of the peduncle of the antennula subequal in length, very slightly shorter than the first ; flagellum imperfect. Ultimate segment of the peduncle of the antenna longer than the penultimate, and almost as long as the last two segments of the peduncle of the antennula ; flagellum nearly twice as long as the peduncle, and composed of about seventeen segments ; the last segments of the peduncle and the proximal portion of the flagellum quite thickly villose.

First pair of gnathopods with the carpus short and triangular ; the propodus not quite twice as long as broad, of the same breadth at each end, the palmary margin slightly oblique and a little convex in outline, armed with a slender spine on the inside at the rounded posterior angle, and clothed with a few hair-like setæ, as is also the distal portion of the posterior margin ; the dactylus long and strongly curved, so as to reach round upon the posterior margin. Second pair of gnathopods with the propodus caudate in outline, about five-sevenths as broad as long, and narrowed rapidly distally ; the palmary and posterior margins forming a continuous curve of nearly the same convexity as the anterior margin, densely villose throughout, and armed on the inside, at the tip of the closed dactylus, with a single stout spine ; dactylus about half as long as the propodus, stout and strongly curved. Posterior pair of pereopods only slightly longer than the fourth pair, which are considerably longer than the third pair ; the bases of these three pairs, with the posterior margins expanded, evenly arcuate and unarmed. Infero-posterior angles of the second and third segments of the pleon right-angled but not produced. Uropods all short ; the bases of the first and second pairs reaching to the same point, and the inner rami in both slightly longer than the outer ; third pair about as long as the bases of the second, and with the ramus about as long as the base.

Length, excluding antennæ, nearly 10^{mm}.

Rocky beaches, Kerguelen Island.

This species is evidently very closely allied to *Hyale hirtipalma* (Allor-

chestes hirtipalma, Dana, Crustacea United States Exploring Expedition, p. 888, pl. 60, fig. 4, 1852) from the coast of Peru. According to the description and figures, however, the propodus in the first pair of gnathopods in that species is much narrowed proximally, the propodus in the second pair is twice as long as broad, the palmary margin is slightly emarginated in the middle, and there is no mention made of any spine. The maxillæ and maxillipeds agree well with the figures of those appendages given by Dana.

LYSIANASSIDÆ.

LYSIANASSA KIDDERI, Smith, s. n.

Eyes of moderate size, oval and black. Antero-lateral margin of the head produced, nearly right-angled, with the angle very slightly rounded. Basal segment of the peduncle of the antennula stout and about as long as the head; second and third segments very short; flagellum scarcely longer than the peduncle; secondary flagellum about half as long. Antenna in the female scarcely longer than the antennula; all the segments of the peduncle very short; the flagellum tapering rapidly, and composed of only seven or eight segments. In the young males the antenna is much longer than the antennula, and the flagellum is composed of twelve to fifteen segments, and furnished along the upper side with vase-shaped sensory organs.

First pair of gnathopods, not subcheliform, short; carpus much stouter than the propodus and nearly as long; propodus tapering distally to scarcely more than the breadth of the dactylus, which is stout, and not more than a third as long as the propodus. Second gnathopods slender; carpus fully a third as broad as long, slightly narrowed distally; propodus almost as wide but not as long as the carpus; the extremity truncated, with the posterior angle produced into a small tooth opposed to the minute hooked dactylus, which arises at its base and below the middle of the terminal margin; the posterior edge is armed with short and acute spines, while the anterior edge and the sides are clothed with slender setæ, and the terminal margin, above the base of the dactylus, with longer and stouter setæ, curved at the tips. Coxæ of the third pair of pereopods broader than long. Posterior edges of the bases of the third to the fifth pair evenly curved, with only very slight emarginations at the insertions of the very minute and widely-separated marginal hairs; the meral segments of the same appendages broad, and their

postero-inferior angles strongly produced. Infero-posterior angles of the second and third segments of the pleon obtusely rounded and not produced. Uropods all short; the posterior pair especially so; the base as thick as long; the outer ramus slender and shorter than the base; the inner minute, not more than half as long as the outer. Telson as broad as long, narrowed toward the extremity, which is truncated and slightly excavated.

Length, excluding antennæ, 3^{mm}. to 4^{mm}.

Rocky beaches, with the last species.

All the specimens received are apparently immature, and the males evidently, and very likely the females also, have not attained the adult characters. The species does not agree fully with the characters assigned by Boeck to the genus *Lysianassa* as restricted by him, and I therefore subjoin a description of the appendages of the mouth.

The mandibles are slender, with the molar area half-way from the tip to the attachment of the long and slender palpus which arises near the base. The inner lobe of the first maxilla is large, reaches more than two-thirds of the way to the tip of the outer lobe, and is furnished with two very minute setæ at the tip and numerous fine hairs along the inner margin; the palpus is very slender and tapers to a point, near which it is armed with a very few slender spines. The inner lobe of the second maxilla is broad and nearly or quite as long as the outer lobe. The inner lobe of the maxillipeds is elongated, armed at the tip with three obtuse teeth, and reaches to the distal extremity of the second segment of the palpus; the outer lobe is very large, unarmed, and reaches beyond the middle of the third segment of the palpus; the palpus is slender, the ultimate segment styliform and less than half as long as the penultimate.

The antennulæ, mandibles, second maxillæ, maxillipeds, and posterior uropods are more like some of the species of *Orchomene* than they are like the species of *Lysianassa*, as described and figured by Boeck, and the characters assigned to *Lysianassa* by this author would require considerable modification to admit our species.

Lysianassa kergueleni, Miers (Annals and Magazine Nat. Hist., iv, vol. xvi, p. 74, 1875), collected at Kerguelen by the Rev. A. E. Eaton, judging from the very short description, is quite a different species and not a *Lysianassa*, even in the unrestricted sense in which that generic term is used by Kroyer and Bate, for the first pair of gnathopods are said to be "subchelate."

GAMMARIDÆ.

ATYLUS (?) AUSTRALIS, Miers (?)

? *Paramæra australis*, Miers, Annals and Magazine Nat. Hist. iv, vol. xiv, 75, July, 1875.

? *Atylus australis*, Miers, loc. cit., 117, Aug., 1875.

There are, in Dr. Kidder's collection, a considerable number of specimens of an *Atylus*-like amphipod which I very hesitatingly refer to this species described by Miers from specimens collected at Kerguelen Island by the Rev. A. E. Eaton. Dr. Kidder's specimens differ in several points from the very brief description given by Miers. The most important of these differences is the existence of minute secondary flagella upon the antennulæ of our specimens, while Miers's species is said to have "exappendiculate" antennulæ. Although the secondary flagellum has usually been said to be wanting in all the *Atylineæ*, it exists, according to Bate, in the young of the typical *Atylus carinatus*, Leach, and it has very likely been overlooked in the adults of some of the species of the group. Its minute size might have caused it to be overlooked by Miers in the present case. This species cannot be referred to the genus *Atylus* as restricted by Boeck, but, on account of the doubt in regard to the identity of our specimens with the species described by Miers, and the doubt whether *Paramæra* should be retained for Miers's species if a distinct genus, I content myself on the present occasion with the following description of the species in my possession:

The eyes are very large, oval, and black. The anterior margin of the head projects in a slight obtuse angle, between the bases of the antennulæ. The antennulæ are furnished with a minute secondary flagellum of a single segment, considerably shorter than the diameter of the first segment of the primary flagellum, but tipped with two slender setæ several times as long as the segment itself.

The gnathopods of the male are subequal, but those of the second pair are somewhat larger than the first. The carpus in each pair is about half as long as the propodus, and the distal portion of the posterior margin is armed with numerous setæ. The propodus in the first pair is about a third as broad as long; the edges are nearly parallel, but both slightly convex in outline; the posterior margin is furnished with fascicles of short, setiform hairs; the palmary margin is furnished with a narrow lamellar edge, is slightly oblique, evenly convex in outline, and the posterior angle is broadly rounded and continuous with the posterior margin, which, however, is armed, each side, with several stout

spines. The dactylus fits closely to the palmary margin. The propodus in the second pair is in all respects similar, but stouter, being fully half as broad as long; the palmary margin is a little more oblique, not quite as convex in outline, and the spines at the posterior angle are stouter. The dactylus is so much curved that it does not fit closely the middle part of the palmary margin. The gnathopods of the female are similar to those of the male, but much weaker and nearly equal in size, and the setæ of the posterior margins of the carpi and propodi are very much longer. The propodus in each pair is only a little longer than the carpus, about half as broad as long, and slightly narrowed proximally, and the palmary margin is very nearly transverse, with its posterior angle only very slightly rounded.

The inferior margins of the first three segments of the pleon are slightly arcuate and armed on the outside with a submarginal series of short spines, but the edge is not serrate. The posterior margins of the first and second segments are nearly straight and make nearly a right angle, very slightly rounded, with the inferior margins, while the posterior margin of the third segment is arcuate with the inferior angle broadly rounded. The peduncles of the second uropods do not reach to the tips of the peduncles of the first pair, and the outer rami in both these pairs are much more slender and considerably shorter than the inner, which reach nearly or quite to the tips of the third pair. The rami of the posterior uropods are subequal, longer than the peduncles, taper regularly to acute points, and are armed along each margin with stout spines and long setiform hairs, the latter principally upon the outer margins. The telson is about two thirds as broad as long, narrowed distally, divided two-thirds of the way to the base, and armed with a slender spine at the tip of each lobe, and often with one or two additional spines on each side.

Length of the largest specimens, excluding the antennæ, in the females about 9^{mm}; in the males a little less.

The mouth-appendages agree very well with those of *Atylus carinatus*, as figured by Kroyer (Voyages en Scandinavie, en Laponie, etc., pl. 11, fig. 1), but the mandibular palpus is considerably stouter than represented in the figures referred to, and the second and third segments are very nearly equal in length, the second segment somewhat stouter than the third.

Rocky beaches, Kerguelen Island.

ISOPODA.

ASELLIDÆ.

JÆRA PUBESCENS, Dana.

Jæra pubescens, Dana, United States Exploring Expedition, Crustacea, 744, pl. 49, fig. 9, 1852.

Associated with the following species upon rocky beaches, Kerguelen Island. Dana's specimens were from Nassau Bay, Tierra del Fuego.

SPHÆROMIDÆ.

SPILEROMA GIGAS, Leach.

Sphæroma gigas, Leach, Dictionnaire des Sciences naturelles, vol. xii, 346 (*teste* Desmarest and Edwards).—Desmarest, Considérations générales sur la classe des Crust., 301, 1825.—Edwards, Histoire naturelle des Crust., vol. iii, 205, 1840.—White, List of Crustaceans in British Museum, 102, 1847.—Dana, United States Exploring Expedition, Crustacea, 775, pl. 52, fig. 1, 1852.

A large series of specimens of all sizes from 5^{mm} to 29^{mm} in length were obtained, all the larger specimens from the gullets of terns, the smaller ones from rocky beaches. All the specimens agree with the typical *gigas*, and do not seem to approach the *S. lanceolata*, White, (Annals and Magazine Nat. Hist., vol. xii, p. 345, 1843, and List of Crustaceans in British Museum, p. 102, 1847).

SEROLIDÆ.

SEROLIS LATIFRONS, White.

Serolis latifrons, White, List of Crust. British Museum, 106, 1847 (no description); Voyage of the Erebus and Terror, Crust., pl. 6, fig. 12.—Miers, Annals and Magazine Nat. Hist. iv, vol. xvi, 74, 1875.

Rocky beach, Kerguelen Island.

Only one specimen was obtained. This is a female, and considerably larger than the British Museum specimen. Our specimen differs somewhat in outline and proportions from White's figure; but the differences are very likely due to sex, although the sex of White's specimen is not stated. The antennæ are smaller than given in White's figure, the peduncle being scarcely longer than the head and the first thoracic segment. The peduncle of the antennula reaches beyond the lateral angle

of the first thoracic segment; the first three segments are scarcely longer than broad, the fourth about as long as the second segment of the antenna, and the fifth about twice as long as the fourth; the third, fourth, and fifth segments are flattened above, with the margins slightly raised, and with a strong median carina.

Length from front of head to tip of pleon, 37^{mm}; length of pleon, 13^{mm}; breadth of first thoracic segment, 24.5^{mm}; greatest breadth at third thoracic segment, 26.5^{mm}; breadth at last thoracic segment, 21.5^{mm}.

ANNELIDS AND ECHINODERMS.

BY A. E. VERRILL.

ANNELIDA.

Very few species of annelids were collected, and only two species are represented by sufficiently well preserved specimens to warrant full descriptions. One of these is a large terebelloid worm belonging to a genus hitherto seldom met with and but imperfectly known.

NEREIS ANTARCTICA, Verrill, s. n.

One specimen of a *Nereis*, about two inches long, lacks some of the caudal segments and part of the tentacular cirri, but is otherwise pretty well preserved in glycerine.

The body is moderately stout and tapers from near the head backward. The cephalic lobe is rather narrow, and suddenly more narrowed in front of the eyes, which are large and prominent, those on the same side almost in contact and nearly in the same line; the frontal antennæ are rather long and slender; the upper tentacular cirri are wanting, but the lower ones are rather long and slender, those of the posterior pair reaching back to the sixth body-segment. The buccal segment is narrower but considerably longer than the following ones, and has a median obtuse angle projecting forward over the posterior border of the cephalic lobe. The lateral appendages of the anterior segments are rather stout, with a longer, slender dorsal cirrus. The upper ramus consists of two short, stout, obtusely rounded lobes, which are nearly equal in length and form, the upper one bearing the dorsal cirrus at about the middle of its upper side, on a slight swelling, while a fascicle of slender compound setæ comes out from between them; these setæ project about twice the length of the setigerous lobes, and all have a moderately

long, slender, acute terminal piece. The lower ramus consists of a smaller, subacute, lanceolate upper setigerous lobe, which is a little longer than the upper ramus, and of a shorter, broad, stout, rounded lower lobe, bearing the small, slender ventral cirrus at its base. The setæ of the lower ramus form two groups, the uppermost consisting partly of slender, acute setæ, like those of the upper ramus, but longer, and partly of somewhat shorter ones with a short, curved, bidentate terminal piece. Farther back the form of the appendages changes gradually, chiefly by all the lobes becoming more elongated and acute, and by the gradual development of a special acute setigerous lobe on the upper ramus. Toward the posterior end of the body the upper ramus becomes more elongated than the lower, with a narrow, elongated upper ligula with the elongated and slender dorsal cirrus arising from a decided hump on the middle of the upper edge, and extending more than half its length beyond the ligula; and the lower lobe is also elongated, lanceolate, obtuse, with a shorter, acute, setigerous lobe arising from its upper side. The lower ramus consists of two lanceolate lobes, the upper or setigerous one being about as long as the setigerous lobe of the upper ramus, while the lower one is a little shorter. The setæ are arranged as on the anterior segments, but those of the upper ramus are the longest; the ventral cirrus is very small and hardly one-fourth the length of the dorsal one.

Kerguelen Island, on the beach; Dr. J. H. Kidder.

It differs considerably from any of those known in the North Atlantic, and would hardly go into any of the generic divisions proposed by Dr. Malmgren.

In the same bottle with this species, and probably made by it, there was a curious nest, made of tough mucus threads, which inclosed numerous small eggs in a long crooked band of many rows. The nest is on the side of a flat alga, which is drawn together by the external looser threads, as leaves often are by *Tortrix* larvæ.

NEOTTIS, Malmgren (emended).

Nordiska Hafs-Annulater, in Öfversigt af Kong. Vet. Akad. Forhandlingar, 1865, 388.

This genus was established for the *Terebella triserialis*, Grube,* from Sicily, by Malmgren, but he states that he had only seen a mutilated specimen, and, owing, doubtless, to this fact, he erroneously gave as one of the characters of the genus the existence of fascicles of setæ on all

*Archiv. für Naturgeschichte, xxi, 118, 1851, tab. iv, fig. 16.

the segments of the body after the third. But Grube states that in his specimens they exist on twenty-nine to thirty-one segments, "fasciculi setarum capillarium ntrinque 29 ad 31."

This genus, as thus emended, is characterized by having transverse groups of simple cirriform branchiæ on each side of the second, third, and fourth segments; fascicles of setæ commencing on the second branchiferous segment and extending to about the thirty-second to forty-eighth; uncini, commencing on the third setigerous segment; the tori, changing to prominent papillæ on the last setigerous segments, and as such extending to the posterior end. The cephalic lobe is short, semicircular, bearing on its front edge numerous tentacles, and on the narrow margin behind the tentacles numerous minute, dark, ocelliform specks.

The genus *Streblosoma*, Sars, is closely allied to *Neottis*, if not identical, but in the former ocelli were not noticed.

Thelepus, Leuck., and *Thelepodopsis*, Sars, are both closely related northern genera, the latter differing only in having gills on but two segments, while the former not only differs in the same way, but the fascicles of setæ extend to the posterior end of the body.

NEOTTIS SPECTABILIS, Verrill, s. n.

Body moderately stout, much elongated; the tubercles bearing fascicles of setæ commence on the second branchiferous segment and exist on from thirty-three to forty-four segments, the highest number occurring on a very large specimen; the size of the tubercles and the number and length of the setæ decreasing backward, so that the last tubercles are quite small, with a few inconspicuous setæ. The tori bearing the uncini, beginning on the third setigerous segment, are low and elongated elliptical, extending downward to the ventral shields; farther back they become narrower and more prominent, becoming quite narrow and elevated at about the twenty-fifth setigerous segment, beyond which the same changes increase at the last setigerous segment, and beyond, to the end of the body they become still more prominent and papilliform, exceeding the last of the setigerous tubercles; of the posterior segments there are 30 or more. On the second to the fifth setigerous segments there is a small rounded papilla between the setigerous tubercles and the tori, on each side. The ventral shields are not very distinctly defined in the alcoholic specimens, especially the posterior ones, so that the number cannot be accurately determined, but they are more numerous than usual; the anterior ones are short but transversely broad, with several deep trans-

verse wrinkles. The cephalic lobe is short and apparently broadly truncate in front, the margin being slightly revolute, and bearing on its anterior surface, in a semicircular group, very numerous long canaliculate tentacles, and on its posterior margin there are numerous minute, inconspicuous, blackish ocelli, forming a crowded row or band on each side; these ocelli are much smaller than in *Thelepus cincinnatus* of our coast. The upper lip is broad, somewhat cucullate, and is produced forward; in a front view it forms about two-thirds of a circle. The lower lip is crescent-shaped and less prominent. The branchiæ are slender, cirriform, much curled, and very numerous, forming transversely elongated groups on the second, third, and fourth segments; the most anterior group being considerably the largest, and extending down on the sides below the level of the setigerous tubercles of the succeeding segments; the third cluster of branchiæ is smaller than the second.

Length of alcoholic specimens, 150^{mm} and upward; diameter, 6^{mm} to 8^{mm}; some of the empty tubes indicate still larger specimens.

The tubes are large and crooked, composed of a tough, thin, translucent, parchment-like lining, to which are firmly and closely cemented coarse grains and small pebbles of black volcanic rock, covering the whole surface, except on the upright terminal portion, which is usually coated with fragments of algæ, mixed with sand. The tubes were attached to stones and pebbles.

Kerguelen Island, twelve fathoms, with roots of *Macrocystis pyrifera*; Dr. J. H. Kidder.

An allied species has been described from the Falkland Islands by Dr. W. Baird as *Terebella bilineata*, but he states that it has 36 segments, with fascicles of setæ, which extend to the posterior end; but it is quite probable that his specimen had lost the posterior segments and really belongs to *Neottis*, with which it agrees in the character of the branchiæ.

SPIRORBIS, species undetermined.

The tubes of a species of *Spirorbis*, having three or four rather slender whorls, either coiled nearly in one plane, or with the part near the aperture turned upward, smooth, or with slight transverse wrinkles, occurred attached to the tubes of the preceding species, and on algæ.

Without the animal, it is impossible to identify with certainty the species of this genus.

ECHINODERMATA.

HOLOTHURIOIDEA.

PENTACTELLA, g. n.

In general appearance like *Pentacta*, but destitute of calcareous plates around the œsophagus, and having a distinct muscular gizzard. Tentacles ten, arborescent, nearly all equal in the typical species. Suckers in five double rows; the intervening spaces smooth.

PENTACTELLA LÆVIGATA, Verfill, s. n.

Body elongated, fusiform, rounded, with thin integuments. Suckers alternating in two rows in each zone, not crowded, larger and more numerous in the three lower zones than in the two upper. Cloacal orifice with small and inconspicuous papillæ. Tentacles ten, subequal, elongated, much divided arborescently from close to the base. Three very elongated vesicles, much dilated in the middle; slender at tips, where one of them is forked. Œsophagus not surrounded by any calcareous plates, with the first portion for about half an inch cylindrical, minutely papillose externally. This is followed by a distinct, rounded gizzard, smooth externally; beyond this the intestine is constricted, but soon expands into the wider part, which is long and convoluted, with two principal folds, so that it is about three times the length of the body. Two arborescently branched respiratory organs; one of them smaller than the other, with its numerous terminal branches among and around the ovaries; the branches of both are elongated and slender; the ultimate ramuli are also elongated and often dilated at the tips. Ovaries in a large cluster; the numerous tubes are simple and more or less moniliform, about half an inch long. The retractor muscles are well developed and extend from the base of the tentacles nearly to the posterior end. The cloacal cavity is large. The calcareous plates of the skin are few in number, minute, and widely scattered, irregularly rounded, with lobed or crenated edges, and perforated by four to eight or more rounded pores, of which two or four primary ones are largest. The smaller plates are often four-lobed, the lobes rounded and each of them perforated by a rounded pore, with narrow interstices, two of the pores often larger; this is perhaps the primary form, from which, by additions to one or several parts of the border, the somewhat larger and

more irregular plates may have been derived. Color in alcohol, dull yellowish brown; tentacles yellowish white.

Length of body, 80^{mm}; diameter, 24^{mm}; length of tentacles, 8^{mm}.

Kerguelen Island, twelve fathoms, January, 1875 (No. 214); Dr. J. H. Kidder.

ECHINOIDEA.

HEMIASTER CORDATUS, Verrill, s. n.

Two quite distinct forms, which, for reasons given below, I believe to be the males and females of one species, occurred together in about equal numbers. The specimens believed to be females have very deep lateral ambulacral grooves and large genital openings; in nearly every specimen several young ones,* varying in size, were found in the ambulacral grooves, held in place by the convergent spines of the borders, which meet across the grooves and interlock. Two of these specimens, on dissection, proved to be females. Those supposed to be males have much shallower ambulacral grooves and differ somewhat in form.

The form of the body in the female is broadly cordate, depressed, with a decided emargination in front; vertically truncate and slightly emarginate posteriorly; broadest a little in advance of the middle. The lower surface is convex and swollen, especially posteriorly; the sides well rounded; the interambulacral areas are swollen on the upper side; the abactinal area and the anterior ambulacrum are considerably sunken; the latter has two well-defined double rows of pores extending to the mouth. The lateral ambulacra are elliptical, rather broad, obtuse at the outer end, and deeply sunken, the anterior ones broader, but scarcely longer than the posterior ones, but those of the opposite sides are not quite equal in size or form. Ovarial openings large, usually but three, that opposite the right anterior interambulacrum being abortive. Lower border of actinostome rather narrow, prominent, and obtuse. Anal area ovate, the lower border rounded, the upper narrowed, but scarcely acute. Peripetalous fasciole well defined, bending upward but little on the posterior and anterior interambulacral areas, and passing nearly straight across the anterior ambulacrum, but bending upward nearly parallel with the antero-lateral ambulacra, so as to form a decided angle in the front part of the lateral interambulacral areas. Subanal fasciole indistinct or wholly wanting. The tubercles of the upper surface are small, crowded, and pretty uniform in size, ex.

* These young have been sent to Mr. A. Agassiz for examination and description.

cept along the borders of the ambulacral grooves, and especially along the anterior one, where they are somewhat larger; beneath they are considerably larger, but not crowded, the largest ones in front, the size decreasing toward the sides, and especially posteriorly. The spines are rather slender, mostly slightly curved, obtuse, and usually flattened at the tips; the larger ones, bordering the ambulacra, are mostly wider, flattened, and canaliculate at the tip; those within the grooves are very slender, and often capitate; the longer spines of the lower side are 6^{mm} to 8^{mm} in length, and much flatter toward the end. Color of spines, in alcohol, dark greenish brown or olive-green; test, yellowish brown. The ovaries are composed of rather large lobules, looking like immature clusters of grapes, and containing large ova. A specimen measures from centre to anterior emargination, 18.5^{mm}; to border of anterior interambulacra, 21^{mm}; to posterior end, 20^{mm}; to lateral border, 18^{mm}; to end of antero-lateral ambulacral grooves, 15^{mm}; to end of posterior ones, 15^{mm}; breadth of antero-lateral grooves, 5 to 5.5^{mm}; of posterior ones, 4.5^{mm}; depth of each, 5^{mm}; height of test, 21^{mm}; of anal area, 6.5^{mm}; breadth of latter, 4.5^{mm}.

The specimens regarded as males are also cordate, and decidedly emarginate in front, but the form is more elliptical, owing to the ambitus being narrowed opposite and in front of the antero-lateral ambulacra, so that the width decreases nearly equally from the middle, though somewhat more so posteriorly. The interambulacra are less swollen, and consequently the abactinal area is less sunken. The anterior ambulacral furrow is decidedly sunken, though somewhat less so than in the female; but the four other ambulacra are narrower and very much shallower than in the female, being but little deeper than the anterior odd one, with the sides sloping gradually to the central line, while in the female the sides of the grooves are perpendicular, or even overhanging, with a broadly-rounded bottom. The three genital openings are only about half as large as in the female. In the character of the spines, tubercles, peripetalous fasciole, anal area, plastron, actinal area, and lower lip, the two forms agree very closely.

Kerguelen Island, 7 fathoms; Dr. J. H. Kidder.

On most of the specimens were several specimens of a small bivalve shell (*Lepton parasiticum*, Dall) most frequently attached to the under surface, near the mouth. This is evidently a case of "commensualism," for the mollusk is not a genuine parasite but a "messmate" of the echi-noderm.

The specimens of this species described as *females* have some resemblance to *H. cavernosus*, A. Ag.* (*Tripylus cavernosus*, Phil.), from Patagonia, which is the nearest allied form hitherto described. The latter differs, however, in its pentagonal or elliptical form, less emarginate in front, the anterior ambulacrum being but slightly suken; in having the anal area elliptical and pointed at both ends; the peripetalous fasciole less angulated laterally; the tubercles of the lower surface larger, etc.

The specimens regarded as *males* resemble to about the same extent *H. australis*, A. Ag.† (Phil. sp.), also from Patagonia. The latter differs in being scarcely emarginate anteriorly and not cordate, in having the fasciole less angulated laterally, etc. The two forms from Patagonia differ one from the other in the same way as do the two supposed sexes of *H. cordatus* described above, so that, if my view be correct, the two forms described by Philippi will prove to be only the two sexes of one species for which the name *australis* would be the most appropriate. In *H. cavernosus* the genital pores are large, and the lateral ambulacral grooves are deep. In *H. australis* the genital pores are small, and the ambulacral grooves shallow. It is also probable that the sexes may differ in a similar manner in other related genera.

ASTERIOIDEA.

ASTERIAS RUPICOLA, Verrill, s. n.

A small species, with five short, broad, rapidly tapered rays, but little longer than the radius of the disk. Disk rather thick and swollen, relatively large. Rays swollen, convex above, flat below, broad at base, where the breadth is often equal to half the total length, measuring from the mouth. The longer radius is from two to two and a half times as great as that of the disk. The ambulacral furrows are broad, with very numerous, closely crowded, slender sucker-feet. The grooves are bordered by a single and very regular row of slender, slightly clavate, obtuse adambulacral spines, which are generally spread outward from

* Revision of the Echini, part iii, p. 587, pl. XXI^c, figs. 1 and 2, 1873.

† Op. cit., p. 586, pl. XXI^c, fig. 3. It is proper for me to state that after the above description was in type, Mr. A. Agassiz, to whom I had sent a specimen of each of the forms for examination, wrote to me that he thinks them identical respectively with the two species of Philippi here referred to, notwithstanding the differences noted. I have thought it best, however, to keep them separate until a larger series of specimens of the American species can be studied.

the grooves at a wide angle. Beyond these there is a longitudinal series of larger and stouter obtusely conical ventral spines, arranged in divergent clusters of two to four. Between these and the adambulacral series there are a few scattered spines and a series of large branchial papillæ, mostly placed singly; but above them the papillæ are numerous, mostly crowded in clusters of four to six, both on the sides and dorsal surface. Along the sides of the rays and separated from the ventral series by a wide space there is a row of plates a little more prominent and larger than the rest, bearing spines that are a little larger and more elongated; otherwise the spines are irregularly scattered, and nearly uniform in character, over the upper surfaces of the rays and disk. These spines are small, short, with obtusely rounded, and usually swollen, rough tips; they mostly arise singly from the dorsal plates, which are thin and flat, and rather closely united together. Madreporic plate nearer the centre than the edge of the disk, small, inconspicuous, rather sunken, composed of few convolutions. Major pedicellariæ few, mostly situated along the inner border of the ambulacral grooves, longovate, with obtuse tips; minor pedicellariæ few, with appressed spatulate or broadly rounded valves; they do not form wreaths around the spines, but are mostly placed singly on the naked spaces between them, especially on the sides and ventral surface of the rays. Color of alcoholic specimens. dark reddish brown above, yellowish beneath.

One of the largest specimens measures from mouth to edge of disk, 12^{mm}; mouth to tip of rays, 30^{mm}; breadth of rays at base, 12^{mm}; length of adambulacral spines, 2.5^{mm}. Smaller specimens have the rays relatively stouter and broader.

Kerguelen Island, on rocky beach, common; Dr. J. H. Kidder, 1874.

OPHIUROIDEA.

OPHIOGLYPHA HEXACTIS, E. A. Smith.*

Annals and Magazine of Natural History. Vol. 17, iii, February, 1876.

Disk hexagonal, with very shallow notches at the bases of the six rays; upper surface slightly swollen, covered with numerous irregular,

* This species had been described as new, under another name, but the description by Mr. Smith was received while correcting the proof. Although there seems to be no question as to the identity of the species, my specimens differ slightly from those described by Mr. Smith. Therefore I have allowed the description to remain, without change.

In the article referred to Mr. Smith also describes the following species from Kerguelen Island; *Asterias meridionalis*, Perrier; *A. Perrieri*, S.; *Pedicellaster scaber*, S.; *Othilia spinulifera*, S.; *Pteraster affinis*, S.; *Porania antarctica*, S.; *Astrogonium meridionale*, S.; *Leptychaster kerguelenensis*, S.; *Ophiacantha vivipara*,? Ljung.; *Ophioglypha brevispina*, S.

unequal, and rather small convex scales, among which the primary ones may be distinguished by their somewhat larger size; radial shields small, wide apart, more or less encroached upon on all sides by the surrounding scales, the exposed portion being rounded or oval; there is a group of a few small scales in the notch at the base of the arms, but neither the notches nor the arm-plates are bordered with papillæ. Lower surface of the disk covered with irregular, flattened scales. Genital slits, with a series of very numerous small, grain-like papillæ along the outer edge, and extending around the upper end and a short distance down the inner margin; on the middle of the outer margin they are crowded in three or four rows, but around the outer end they form a single row. Arms six, about twice as long as the diameter of the disk, convex above, rapidly tapering from the base to the tip. Upper arm-plates, near base of the arms, short, more or less concealed laterally by a group of three or four small, irregular, imbricated scales, on each side, which usually do not extend across the arm, and toward the middle of the arm these are reduced to a single small, triangular scale, and this also soon disappears; toward the middle of the arm the upper plates are nearly as long as broad, the outer and inner edges being nearly parallel and slightly curved; farther out they become longer than broad, and irregularly hexagonal, the proximal end narrowest. Arm-spines three, rather short, subfusiform, tapering to a blunt point, the upper one a little the largest, the length about equal to that of the upper arm-plate toward the base of the arms, but shorter toward the end. Under arm-plates transversely elliptical, with a distinct angle in the middle of the proximal edge, where the lateral plates do not quite unite, leaving slight pits toward the base of the arms. Tentacle-scales, beyond the middle of the arms, single, short, flattened; from about the eighth to sixteenth joints there are two tentacle-scales, the inner one becoming quite small before disappearing; on the second to seventh joints there are mostly three tentacle-scales, the inner one quite small; on the first, and sometimes on the second joint, there are four tentacle-scales, and also a similar group of three or four scales on the opposite border of the tentacle-pores. The outer oral tentacle-pore is very large, in the form of a broad, oblique fissure, occupying more than half the length of the jaw, bordered externally by a row of about five flattened, squarish scales, of which the distal one is largest, and an inner row of four or five smaller ones, of which the proximal ones are situated within

and below the border of the mouth-slits. The mouth-papillæ consist of two small, conical, pointed ones at the angle of the jaw, below the teeth, and of an irregular row of two to four smaller ones on each side, running outward and downward below the proximal papillæ of the upper oral tentacle. Teeth, seven to nine on each jaw, stout, obtuse, the series often double in the middle. Mouth-shields broad, spade-shaped, the broad proximal portion terminating in an obtuse point, the somewhat narrowed distal portion extending outward in the interradiar spaces about half the total length and broadly rounded at the end. Side mouth-shields long and narrow, somewhat enlarged at the ends, narrower in the middle. The oral tentacles are very large in the alcoholic specimens, projecting inward beyond the ends of the mouth-slits, and nearly filling them up; they are divided into a series of lobes by transverse constrictions.

Color of alcoholic specimens very dark slate-brown above; yellowish brown beneath.

One of the larger specimens measures, across the disk, 18^{mm}; length of arms from dorsal notch, about 35^{mm} (tips broken off); diameter at base, without spines, 2.25^{mm}; length of spines, 1^{mm}.

Kerguelen Island, five fathoms; Dr. J. H. Kidder.

This species differs widely from all the previously described species of *Ophioglypha*, in having six arms, in the shallow notches at the bases of the arms, and in the characters of the mouth-papillæ and mouth-shields, but in size and general appearance it somewhat resembles some varieties of *O. sarsii* of the North Atlantic. In several respects it is related to *Ophiecten*, but though the surface of the disk is covered with a thin, rough skin, it is not distinctly granulated. Although it would not properly go into either of these two genera, as they are ordinarily defined, it seems most natural to refer it to *Ophioglypha*, which may easily be emended in respect to some of the characters that may now be regarded as merely specific.

ASTROPHYTON AUSTRALE, Verrill, s. n.

Disk unevenly granulous, with ten prominent radiating ribs, starting near the center and extending to the lateral bases of the arms; they are broadest and highest near the outer end, which is gently sloped and evenly rounded. The ribs bear four to ten or more unequal,

large, stout, blunt spines, with rugose tips, arranged irregularly in one or two rows, or scattered unevenly, while there is usually a group of from three to six smaller spines on the spaces between the ribs at the bases of the arms, and often one or two on the interbrachial spaces, near the edge of the disk. Similar small, blunt spines, or tubercles, extend along the dorsal surface of the arms, either in single or double rows. The grains covering the disk and upper and lateral surfaces of the arms are quite uneven in size and prominence, with more or less numerous small, flattened plates or scales scattered among them, and in many parts these scales are more regular, with the grains arranged around their borders, this condition being most apparent on the arms; the prominent tubercles and spines are developed from the center of similar scales or plates. The under side of the disk is more regularly granulous. The arms are rather slender and well rounded dorsally, dividing first at about their own diameter from the ends of the radial ribs; the distance from the first to the second division of the arms is about equal to the larger radius of the disk; and from the second to the third usually somewhat greater. The terminal divisions are numerous and very slender. The arm-spines, toward the base of the arms, are small, stout, fusiform, terminated by two acute spinules, and form transverse rows, usually from five to seven, but farther out they became shorter and stouter in rows of two to four; still farther out the two or three terminal spinules become curved, and near the ends of the arms they have the form of minute hooks.

Color of one dried specimen uniform brownish yellow; of the other light grayish brown, with many narrow transverse bands of darker brown across the arms and radial ribs, changing into irregular streaks and spots of the same color on the interradian spaces.

The larger specimen measures, from center to end of radial ribs, 16^{mm}; center to edge of interbrachial spaces, 13^{mm}; center to first division of arms, 21^{mm}; diameter of arms near base, 5^{mm} to 6^{mm}; beyond first division, 4^{mm}; beyond second division, about 3^{mm}; diameter of larger spines on radial ribs, 2^{mm}; height, 2^{mm}.

Pearson's Point, D'Entrecasteaux Channel, Tasmania, seven fathoms, clinging to *Primnoella australasica*; Capt. Ralph Chandler, (Poughkeepsie Soc. Nat. Science.)

ANTHOZOA.

ALCYONARIA.

ANTHOPODIUM AUSTRALE, Verrill, s. n.

Polyp-cells cylindrical or somewhat clavate, with eight distinct sulcations at summit, in contraction; the surface covered with small, rough spicula; the height variable up to a quarter of an inch or more. They arise from a thin encrusting or stolon-like cœnenchyma, which is coriaceous and roughened with spicula, like the polyp-cells. The polyps are irregularly scattered along the cœnenchyma, which creeps over the upright axis of *Primnoella*. Color, light orange-red. Height of polyp-cells, mostly 2^{mm} to 6^{mm}; diameter, about 1.5^{mm}.

The spicula are small, but exceedingly variable in form, and most of them are covered with rough or even lacerate warts, which interlock and thus strengthen the tissues; many of them are flattened. The largest spicula, and perhaps the most abundant, are oblong, two to four times as long as broad, obtuse at the ends, and thickly covered with rough spinulose warts; others are enlarged and irregularly flattened at one end, which is covered with rough laciniate spinules and warts; others, equally rough, are shorter and sometimes irregularly rounded, about as broad as long; irregular rough laciniate crosses are not uncommon; and there are numerous slender fusiform spicula, acute at the ends, about as long as the largest ones, but not half as thick, and less roughly warted; various other more or less intermediate forms also occur.

Bluff Harbor, New Zealand, on *Primnoella australasiæ*; Dr. E. Kershner.

This species is more nearly allied to *A. rubens*, V., from North Carolina, than to any other species known to me.

PRIMNOELLA AUSTRALASIÆ, Gray.

Primnoa Australasiæ, Gray, Proc. Zoölog. Society of London, 1849, 146, pl. 2, figs. 8, 9; Annals and Magazine of Nat. History, 1850, 510.

Primnoella Australasiæ, Gray, Proc. Zoölog. Society of London, 1857, 286; 1859, 483; Catalogue of Lithophytes or stony corals in the collection of the British Museum, 50, 1870.

The specimens are simple, cylindrical stems, some of them more than three feet in length, with the base attached to shells. The polyp-cells are elongated, cylindrical, arranged in close whorls, and closely appressed

to the surface of the stem, with the summit incurved and mostly concealed. There are sixteen to twenty-four or more cells in a single whorl, and the successive whorls are so crowded as to leave only a narrow line between them, except toward the base, where the polyp-cells become shorter and imperfect, leaving spaces often equal to their length between the whorls; in these places the cœnenchyma is covered with small imbricated scales, similar to those of the cells. On the outer or exposed surface of the cells there are two alternating rows of imbricated scale-like spicula, ten to twelve in each row.

The axis is slender, round, tapering from the base to the tip, where it becomes very slender and translucent yellowish horn-color, while toward the base it is dull grayish brown, opaque, rigid, and stony; the middle portion is grayish or ash-color, and sometimes whitish; its surface is sulcated with numerous slightly impressed grooves. Color of the cells and cœnenchyma, yellowish white.

One of the larger specimens, imperfect at the tip, is about 36 inches (915^{mm}) long; greatest diameter, 4^{mm} to 5^{mm}; diameter of axis near base, 2.5^{mm}; length of cells, 2^{mm}.

Bluff Harbor, New Zealand; Dr. E. Kershner; several specimens.

One specimen, from seven fathoms, near Pearson's Point, Tasmania, was sent to me from the Poughkeepsie Society of Natural Science, as received from Capt. Ralph Chandler, U. S. N.

According to the label of the last-named specimen, the native name is "Urialus."

[*Actiniæ* were numerous along the rocky shores of Kerguelen Island. Specimens have been preserved in alcohol, but not in a condition to admit of specific determination, the tentacles being, of course, retracted. All of those seen by me were of small size and sober colors, mostly of a dark brown; with the exception of one rather rare species, expanding to about the size of a silver half-dollar, the tentacles of which were of a brilliant vermilion. J. H. K.]



APPENDIX.

SURGEON E. KERSHNER'S COLLECTION.

MINERALS.

These include forty-two specimens, representing portions of Otago and other parts of New Zealand. A considerable number was obtained from the museum at Otago, being specimens gathered during the geological survey of the province. Of the remainder, most were collected by Dr. Kershner himself. Besides those already mentioned, this collection includes some fine specimens of copper-ore from the mines in Southern Africa. All of the minerals have been identified by Dr. F. M. Endlich, of the Smithsonian Institution, as per list following :

Original No.

- | | | |
|--|---|--|
| Geol. survey of Otago. | { | 19. Pumice (typical specimen). |
| | | 20. Doleritic rock with zeolites. |
| | | 21. Chrome-ore (Otago Museum). |
| | | 22. Hornblende. |
| | | 23. White quartz. |
| | | 24. White quartz with decomposed feldspar. |
| | | 25. Iron and copper ore. |
| | | 26. Same as 20. |
| { | 27. Pyrite and mica in chloritic schist (Otago Museum). | |
| | 28. Chalcopyrite (Otago Museum). | |
| 29-40. Bornite (copper-ore) associated with quartz. | | |
| 41. Quartzitic rock impregnated with pyrite. | | |
| 42. Copper-ore. | | |
| 43. Lignitic coal (Germ. sp. name, Russkohle). | | |
| 44. Feldspathic rock decomposed into caolinite. | | |
| 45. Quartzitic rock containing caolinite and impregnated with pyrite | | |
| 46. Galena and quartz. | | |
| 47. Druse of natrolite in basalt. | | |
| 48. Sulphur. | | |
| 49. Chalcopyrite (copper pyrite). | | |

Original No.

50. Sulphur.

51. Very impure graphite with quartz.

52. Pyrite and quartz.

53. Copper-ore, sulphide and carbonates.

54. Natrolite in basalt.

55. Same as 53.

56. Compact limonite (hydrated sesquioxide of iron).

57. Coal.

58. Chrome-ore.

59. Covellite (copper indigo), copper mineral.

60. Same as 44.

61. Sulphur.

62. Aragonite (carb. of lime), radio-columnar.

Fossils are not determined as yet; nor greenish mineral in basalt. Former appear to be carboniferous.

MISCELLANEOUS.

Nat. Mus. No.

14783 }
14784 } Two skulls, with leg-bones of Maoris, from Chatham Island.

14782 Skull of Maori-ori, or Chatham Island aborigine, concerning which Dr. Kershner writes that it was "picked up from the surface of the ground, having been exposed to the weather. It is said that this race never buried their dead, but carried them out and deposited them in heaps, where they were left to decay, so that the bones are easily found in many different parts of the island. They were cannibals; the remnants of the race now found in the island having been known to practice cannibalism as late as about ten years ago. They now number only about twenty-five souls, are limited to a reservation, and sustained by the colonial government. The name Maori-ori is said to mean 'before the Maoris,' and indicates that these people, the aborigines of Chatham Island, had been subdued and, in great measure, displaced by the Maoris." It seems not improbable that this race represents also the aboriginal inhabitants of New Zealand, which had quite disappeared before the discovery of the islands by Europeans. Chatham Island lies east of New Zealand, at the distance of about six hundred miles, in latitude 48° south.

Nat. Mus. No.

- 20254 } Are stone implements of the Maori-ori; a large cleaver-shaped
 20255 } stone hatchet and two chisels, also of stone.

Skin and skeleton of *Dasyurus maculatus*. Concerning this animal, Dr. Kershner writes that it was captured in the mountainous part of Tasmania, near Hobarton; and that it is so destructive to young lambs that it is being rapidly exterminated by the colonists, who call it "tiger-cat." The skin is a very fine one, and has been mounted and placed in the museum collection.

- 1478 Skin and skeleton of *Ornithorhynchus paradoxus*, the "beast with the bill." The skeleton is perfect, but the skin has been somewhat curtailed by trimming, and is valuable only as exhibiting the softness and fineness of the fur. Obtained near Hobarton, Tasmania.

Strigops habroptilis, the "owl-eyed parrot" of New Zealand, obtained from Otago Museum by the courtesy of its curator, Captain Hutton. The bird is nocturnal in its habits, burrows in the ground or in holes in the rocks, and feeds upon worms and grubs. It is becoming very scarce since the introduction of dogs and cats into the island.

Buphagus skua antarcticus, shot at Hobarton. Same species as that observed at Kerguelen, the hawk-like habits of which were described in the National Museum Bulletin No. 2. This individual was shot in the act of devouring a tame duck which it had just captured in the yard of a resident of Hobarton. It is said even to attack young lambs, and to be very destructive to domestic fowls.

Skin of king penguin (*Aptenodytes longirostris*) obtained at Kerguelen Island, but really captured on the Falkland Islands.

A large collection of bones of the moa (*Dinornis*), the great extinct New Zealand bird, from Christ Church (Middle Island), New Zealand. These have not yet been put together or carefully examined.

- 15485 Head and fins of *Trigla*, *sp.*, from Port Arthur, Tasmania. A fish nearly allied to and much resembling the "sea-robin" of the New England coast.

- 15484 Mutilated skin of *Aracana*, *sp.*, from Hobarton, a fish closely resembling the trunk-fish (*Ostracion*).

Nat. Mus. No.

Hippocampus, sp. Port Chalmers, New Zealand. Of very unusual size.

Anguilla aucklandii, Richardson, from Bluff Harbor, New Zealand. An enormous eel.

In the subkingdom MOLLUSCA, Dr. Kershner's collection is peculiarly rich, including large series of shells from New Zealand, Tasmania, the Auckland and Chatham Islands, besides a very handsome *Cephalopod* (*Ommastrephes*), preserved in alcohol. The shells are now undergoing examination by Mr. W. H. Dall. The botanical collections, also very large, include specimens of the "Ake-aka," an aromatic wood from Chatham Island, and of the seeds of the "Kapu-kapuka" or Chatham lily (*Myosotidium nobile*, Hooker), a flower greatly prized for its beauty. The lily grows only on the verge of the sea-beach, in shady places, in a soil composed of rich mold mixed with sand. If cultivated in gardens it should be watered with salt-water. Besides these are series of ferns from all the localities visited, and a considerable collection of flowering-plants from the Auckland Islands. The plants have been sent to Cambridge for identification; the woods are at the Agricultural Department, Washington.

The collection of plants from the Auckland Islands was taken from the neighborhood of the German transit-station at that place, the same locality occupied by Sir James Clarke Ross when at the Aucklands in 1841, in the Erebus and Terror.

The *Crustacea*, which have been identified by Prof. S. I. Smith, are found to be as follows:

2209 *Heterograpsus serdentatus*, Edw.

Petrolisthes elongatus, Stimp.

2210 *Livoneca*, near *emarginata*, Bleeker. An isopod parasitic upon fish.

The following note upon some interesting hydroids found in Dr. Kershner's collection is given as received from the writer, Mr. S. F. Clark, of Yale College :

HYDROIDEA.

"Among the invertebrates sent to New Haven, for identification, by Dr. Kidder, is a fine specimen of a pedunculated ascidian, belonging to the genus *Bottenia*. This same genus is represented on the New Eng-

land coast by the species *Bolteni*, the stems of which are the favorite abiding places of many hydroids; and it is interesting to note that the three genera, *Sertularia*, *Sertularella*, and *Laföcä*, which are almost invariably represented on our New England species, are also represented on the stem of this southern specimen.

"The species of *Sertularia* is very close to, if not identical with, *S. operculata* of Linnaeus; but there being no gonothecæ present on either of the three species, I shall not attempt to make specific determinations.

"The genus *Sertularella* is represented by a species resembling in mode of growth the *S. tricuspidata* of Alder. Hydrothecæ alternate, stout, and with a tricuspid rim. Possibly this is identical with the *Sertularia johnstoni* of Murray. (Dieffenbach's New Zealand, London, 1843.)

"The third species is probably a member of the genus *Laföcä*; it is a creeping form, and many of the hydrothecæ have only their upper portions free, the lower portions reclining upon the stolon. The ascidian bearing these hydroids was collected at Port Chalmers, New Zealand, in January, 1875, by Dr. E. Kershner, U. S. N."

II.

A considerable collection was also made by Mr. Israel Russell, one of the photographers to the New Zealand party, mostly from the province of Otago, New Zealand. Mr. Russell's collection includes a number of Maori implements, with some supposed to belong to a still older race (perhaps the Maori-ori). His bird-skins represent specimens of *Larus dominicanus* ♀, *Daption capensis*, *Casarca variegata*, Gm., *Podiceps cristatus* (*gustralis*, Gould) ♂, *Porphyrio crassirostris*, Gray, *Creedion carunculatus*, and two pigeons and a parrot, as yet undetermined. Besides these, there are a number of New Zealand birds preserved in alcohol, and a large collection of the bones of the moa.

Other departments of natural history are well represented in Mr. Russell's collection. There are a large number of fossil shells from Lake Wakatipu, New Zealand, and of recent forms from the same pit in which the Maori implements were found. Also, a considerable collection of plants, and of insects, *Crustacea*, and small vertebrates which have not yet been studied.

III.

Mr. Edwin Smith, United States Coast Survey, chief of the Chatham Island party, sends three skulls, two of Maoris and one of a Maori-ori, for the authenticity of which he vouches.

A STUDY OF CHIONIS MINOR WITH REFERENCE TO ITS STRUCTURE AND SYSTEMATIC POSITION.

BY J. H. KIDDER, U. S. N., AND ELLIOTT COOES, U. S. A.

"This small family of birds [*Thinochorus*, *Attagis*, and *Chionis*] is one of those which, from its varied relations to other families, although at present offering only difficulties to the systematic naturalist, ultimately may assist in revealing the grand scheme, common to the present and past ages, on which organized beings have been created." (DARWIN, *Voyage of a Naturalist*, New York, 1871, p. 94.)

CHIONIS MINOR, Hartlaub.

SHEATH-BILL; BEC-EN-FOURREAU.

HISTORY.

The genus *Chionis* was founded by J. R. Forster in 1788,* upon *C. alba*, discovered by him in the neighborhood of Cape Horn. In January, 1841, Dr. G. Hartlaub wrote from Bremen to the Revue Zoölogique † that he had discovered a new species of *Chionis* in the museum at Leyden. He described it as differing from *C. alba* by its decided inferiority in size, by the blackness of the entire beak, and particularly by the extraordinary shape of the sheath of the bill. His original description and measurements are as follows:

"CHIONIS MINOR, Nob., nivea, rostro nigerrimo, pedibus saturate fusciscentibus, spatio supraoculari subrotundo, nudo, nigro, rostri vaginâ subconcarâ, antrosum ascendente, apertâ (in *Ch. albâ*, planâ, incumbente).

| | <i>C. minor.</i> | | <i>C. alba.</i> | |
|--------------------------------------|------------------|--------|-----------------|--------|
| Long. total..... | 13 p. | 2 lig. | 17 p. | 3 lig. |
| rostri à fronte..... | 1 | 2 | 1 | 4 |
| Altit. rostri ad basin..... | | 7 | | 8 |
| Latitud. rostri ad angulum oris..... | 0 | 6½ | | 7½ |
| Long. alæ..... | 9 | | 10½ | |
| tarsi..... | 1 | 10 | 1 | 11 |
| caudæ..... | 4 | 3 | 5½ | |
| digiti medii..... | 1 | 8 | 2 | 1 |

* Enchiridion Hist. Nat. Ins. 1788, p. 37.

† Rev. Zoöl., 1841, v. 5; *ib.* 1842, pl. 2, fig. 2.

"Patrie inconnue."

In the following year he contributed a drawing (of the head) to the same periodical (pl. 2, f. 2).

In 1849 *C. minor* was figured by G. R. Gray,* under a description of the genus which was placed by him in the fifth family (*Chionididae*) of *Gallina*, the other members of the family being *Thinocorus* and *Attagis*. The supposed relationship between these birds was first pointed out, so far as we know, by Mr. Darwin,† in 1833, when, referring to *Thinocorus*, *Attagis*, and *C. alba*, he utters the pregnant sentence we have chosen as the motto for this essay.

De Blainville meanwhile, in 1836,‡ before *C. minor* had been described, turned his attention to the anomalous relationships of the genus, and decided that its nearest affinity was with *Hæmatopus*. The position he assumed respecting its relationships requires special consideration, since it was defended with learned ingenuity and has been generally accepted without question.

He based his conclusion upon the examination of a skeleton of the trunk of *Chionis alba*, obtained from M. Baillon, of Abbeville, with some details of its internal organization and natural history obtained from M. P. E. Botta, one of his assistants at the Paris Museum. M. Botta's specimen had come on board of a ship, during a commercial voyage around the world, in latitude 55° south, longitude 64° west (between the Falkland Islands and Cape Horn). Previous to this time specimens had been exceedingly rare, only three skins being known to exist, and no anatomical material being accessible.

M. de Blainville enumerates, among those who had already treated of *Chionis*, Forster, Pennant, Latham, Gmelin, Bonnaterre, Illiger, Vieillot, Oken, Temminck, Goldfuss, l'abbé Ranzani, Quoy & Gaimard, Lesson, Wagler, Cuvier, and Isidore-Geoffroy. By these writers it had been successively and alternately considered as a wader (*échassier*), palmipede, and gallinaceous bird, allied (*rapproché*) to three different genera, or considered as a distinct family; while it had been passed over by other naturalists, who did not consider the data sufficiently full for a determination: or held to be *incertæ sedis*, "*ce qui est, en pareil cas, le parti le plus convenable.*"§

* Genera of Birds, 1849, p. 522, pl. —.

† Naturalist's Voyage around the World, p. 94; cf., also, Voy. Beagle, 4to, 1841, pp. 118, 119.

‡ Mémoire sur la place que doit occuper dans le système ornithologique le genre *Chionis* ou Bec-en-fourreau. < Ann. Sci. Nat. vi, 1836, p. 97.

§ De Blainville, l. c.

The three specimens then known to De Blainville were, first, a skin in an English collection, for a long time unique (perhaps Forster's type); second, one obtained by MM. Quoy & Gaimard from the voyage of the *Astrolabe*, in 1824; third, one obtained by MM. Lesson & Garnot, in the course of the voyage of the *Coquille*, when an individual came on board of the ship "at the distance of eighty leagues from Patagonia, the nearest land." "Anderson observed it in flocks in Christmas Harbor," but appears to have given no description by which the peculiarity of the Kerguelen species (*C. minor*) was recognized, and of which this is the first recorded observation.

M. de Blainville describes briefly the external parts of *C. alba*, and the skeleton, the latter including of the skull only the posterior part without the occiput, and being defective also as to the coccyx and limbs. He appears not to have seen either the muscles or viscera, but to have been dependent for his brief description of the latter upon the sometimes erroneous recollections of M. Botta. It should be noticed that the observations upon the natural history and habits of the genus had been made upon specimens that flew on board of ships at sea, and therefore were not under their natural or wild conditions.

His reasons for referring the genus to the vicinity of *Hamatopus* are summed up by himself (p. 106) as follows:

- "1°. Le nombre des vertèbres 15—6—14—8, est le même.
- "2°. Le nombre et la forme des côtes sont les mêmes.
- "3°. Le sternum, de même forme générale, a deux échancrures sub-égales, la supérieure un peu plus grande que l'inférieure.
- "4°. Le canal intestinal a également trois cœcums, dont deux terminaux médiocres et un médian fort petit.
- "5°. L'estomac est également formé d'un gésier fort petit sans jabot.
- "6°. La queue est courte et composée de six paires de plumes égales.
- "7°. Les ailes, formées de dix plumes à la main, sont aiguës.
- "8°. Les jambes sont peu élevées, et nues seulement vers le talon.
- "9°. Les tarses, non comprimés, sont également réticulés en avant comme en arrière.
- "10°. La plante des doigts est élargie de manière qu'ils semblent bordés latéralement.
- "11°. Ce sont également des oiseaux marcheurs et coureurs;
- "12°. Habitant les rivages de la mer;
- "13°. Où ils cherchent leur nourriture, consistant en coquillages et peut-être en animaux morts."

Since M. de Blainville relied almost entirely upon the characters of the sternal apparatus* in the classification of birds, it is not strange that he should have found in their resemblance to those of *Hamatopus* conclusive evidence of natural affinity. The errors of omission and of observation in the above summary (which, it must be acknowledged, are not to be found in the description of those parts seen by De Blainville himself) will be discussed hereafter in their proper connection.

In his continuation of Bonnaterre's "Tableau encyclopédique et méthodique d'Ornithologie" (pp. 1037, 1038), M. L. P. Vieillot speaks of the *black button* on the wing, and describes the sheath of the bill as sometimes yellow, *sometimes black*. It would thus appear that *Chionis minor* was known and had been examined long before Hartlaub differentiated the species; this black color of the epidermal outgrowths being one of the principal specific features of his diagnosis. Bonnaterre's first mention of the genus (as genus 83 of his list, p. cxij) gives no points to indicate whether he was describing *C. alba* or *C. minor*.

In 1867 Mr. E. L. Layard, writing to the Ibis† from Cape Town, under date of June 17, mentions several specimens of *C. minor* brought alive to the Cape from the Crozet Islands by Captain Armson. "A single egg obtained by him was unfortunately attacked by mice on board; but enough remains to show its contour and color. The instant I saw it I was reminded of the eggs of *Hamatopus*." He describes the egg at some length, and of the living bird says: "He is most *Hamatopus*-like in his motions, moving with great swiftness, and feeding on meat, which he holds down between his feet and tears into shreds. He is very fearless, and attacked the cats which came near him. The legs are livid brown [!], bill black, with a pink cere around the eye, the iris of which is deep black or dark brown in color."

On the 28th of November, 1867,‡ Dr. P. L. Selater exhibited to the Zoological Society a skin of *Chionis minor*, "being that of an individual of this species which had been transmitted living to the society by E. L. Layard, and brought from the Crozet Islands by Captain Armson." This was doubtless the same individual referred to by Mr. Layard in the passage just quoted.

* À ces élémens les plus importans d'une évaluation un peu positive des rapports naturels de cet oiseau (*puisque j'ai montré, depuis long-temps, que l'appareil sternal, avec ses anneaux, les renferme dans cet classe d'animaux*) j'ai pu joindre quelques détails d'organisation intérieure, etc." (*Op. cit.*, p. 99.)

† Ibis, 1867, p. 458.

‡ Proc. Zool. Soc. 1867.

October 26, 1868,* the receipt of two specimens of *C. minor* by the Zoological Society, from Mr. Layard, was recorded without further particulars. They came from the Crozet Islands.

In the Journal of Anatomy and Physiology for November, 1869,† appeared a letter from R. O. Cunningham, M. D., naturalist to Her Majesty's surveying-ship Nassau, with a figure of the cæca, part of the intestine, the stomach, and larynx of *Chionis alba*, accompanied by some measurements. He found that "the legs present a decided resemblance to *Hematopus*, and the sternal characteristics are similar."

An egg of *C. minor* was received by the Zoological Society, January 17, 1871,‡ concerning which Prof. Alfred Newton said: "No egg of either species of this genus had before been known, and this confirms, by its appearance, the systematic position of the form shown by osteology, its affinity, namely, to the plovers."

We have been able to find a record, therefore, of but four specimens of this species, viz: 1. That in the Museum at Leyden, from which the original description was made, of unknown locality; 2. A specimen sent to the Zoological Society by Mr. Layard, from Cape Town, brought from the Crozet Islands; and, 3, 4. Two specimens from the Crozet Islands, also sent to the Zoological Society by Mr. Layard, in 1868.

The literature of the species is meagre, and we do not find that any attempt has been made either to verify or refute De Blainville's conclusions, otherwise than by inspection of external characters, beyond Mr. Cunningham's brief notes upon the digestive system. Authors who have differed from De Blainville respecting the systematic position of the genus have simply placed it where they pleased, apparently without feeling called upon to show cause for the faith that was in them.

The late expedition to observe the transit of Venus at Kerguelen Island afforded an opportunity to improve our acquaintance with this species, which was taken advantage of. Several specimens were preserved in alcohol, a number of skins were secured, and, during a stay of four months upon the island, as frequent and careful observations as possible upon the behavior of the bird during life § were made by Dr. Kidder.

It bears a strong resemblance to the pigeons in form and mode of

* Proceedings Zool. Soc. 1868.

† Pp. 87-89.

‡ Proc. Zool. Soc. 1871, p. 57.

§ See Bull. No. 2, Nat. Mus. 1875. . 1 *et seq.*, for full description of habits, etc.

flight; is easily domesticated, remarkably fearless of man, dislikes water, cannot swim, is largely a vegetable-feeder, and its usual note is a harsh croak. These characteristics, taken together with its attitudes, gait, pugnacity, ready companionship with domestic fowls, and some obvious peculiarities in the structure of the digestive system, seemed to indicate affinity with the *Gallinæ* rather than with *Hæmatopus*, so far as superficial characters have weight. And so strong was this impression, based upon field-observation only, in the mind of the observer, that we have made a somewhat extended anatomical examination of two of the alcoholic specimens, and have studied the slender literature of the subject, with the hope of furnishing the materials upon which to base inquiries that may establish the proper position of this confessedly doubtful group. Allowing due weight to the authority and great name of De Blainville, it is proper to remember that this particular species (*C. minor*), at least, differs from the type-species (*C. alba*), as described, in that it is largely a vegetable-feeder; that there is no record of its having been seen "far out at sea";* and in the characters upon which the diagnosis of the species is based.

For comparison with Hartlaub's original description, the field-measurements of eleven specimens are here quoted:†

List of specimens, with measurements.

| Smithsonian Institution number. | Original number. | Date. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Tarsus. | Middle toe. | Longest claw. | Remarks. |
|---------------------------------|------------------|---------|-------|---------|---------|-------|-------|-------|-------|---------|-------------|---------------|------------------------------|
| | | 1874. | | | | | | | | | | | |
| 68956 | 27 | Oct. 12 | ♂ | 15.50 | 30.50 | 9.00 | ..... | 1.50 | 1.35 | 2.60 | 1.85 | 0.50 | Skin. |
| 68957 | 31 | Oct. 16 | ♀ | 14.00 | 29.00 | 8.50 | ..... | 1.35 | 1.65 | 1.85 | 1.60 | 0.45 | Do. |
| 68955 | 32 | Oct. 16 | ♂ | 15.00 | 31.00 | 9.50 | ..... | 1.50 | 1.60 | 1.80 | 1.60 | ..... | Skin with sternum. |
| ..... | 33 | Oct. 18 | ♂ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Disemboweled and in alcohol. |
| 68958 | 67 | Nov. 14 | ♂ | 15.75 | 32.00 | 9.35 | ..... | 1.50 | 1.75 | 1.75 | 1.60 | 0.40 | Skin. |
| ..... | 127 | Dec. 5 | ♂ (?) | 15.00 | 29.00 | 9.00 | 4.65 | 1.45 | ..... | 1.65 | 1.55 | 0.50 | Alcohol. |
| ..... | 146 | Dec. 11 | ♂ (?) | 14.50 | 29.00 | 8.50 | ..... | ..... | ..... | 1.75 | 1.50 | 0.50 | Do. |
| ..... | 203 | Dec. 29 | ♂ (?) | 16.50 | 30.50 | 9.00 | 4.85 | 1.50 | ..... | 1.85 | 1.75 | 0.50 | Alcohol and carbolic acid. |
| ..... | 204 | Dec. 29 | ♀ (?) | 15.25 | 29.15 | 8.85 | 4.50 | 1.35 | 1.65 | 1.75 | 1.65 | 0.50 | Do. |
| ..... | 205 | Dec. 29 | ♂ (?) | 15.50 | 29.85 | 8.85 | 4.75 | 1.35 | 1.65 | 1.75 | 1.55 | 0.45 | Do. |
| ..... | 206 | Dec. 29 | ♀ (?) | 15.75 | 28.85 | 8.50 | 4.75 | 1.35 | 1.75 | 1.75 | 1.65 | 0.50 | Do. |

* *Vid.* Darwin, *Voy. round the World*, p. 94, and Cunningham, *Jour. Anat. and Phys.* 1869, p. 88.

† From Bull No. 2, Nat. Mus., *loc. cit.*

DESCRIPTION.

The first specimen selected for examination was taken from alcohol November 5. The field-measurements, from the flesh, are as follows:—

| Smithsonian number. | Original number. | Date of collection. | Sex. | Length. | Extent. | Wing. | Tail. | Bill. | Head. | Toes. | Middle toe. | Longest claw. | Remarks. |
|---------------------|------------------|---------------------|------|---------|---------|-------|-------|-------|-------|-------|-------------|---------------|-----------------------|
| 146 | 146 | 1874. Dec. 11 | ♀ | 14.50 | 29.00 | 8.50 | ..... | ..... | ..... | 1.75 | 1.50 | 0.50 | Preserved in alcohol. |

Plumage universally pure white, very soft and downy. Under plumage slate-colored. Bill black, stout, conical; mandibles of equal length. Chord of culmen 1.22, gape 1.35, depth 0.80, width 0.55; depth of upper mandible 0.37, width 0.40; depth of lower mandible 0.30, width 0.55. Commissure nearly straight, with only a slight downward curve towards apex of bill. Lying over the upper mandible like a saddle, with the pommel tilted up into the air, is the horny black sheath which has given to this bird one of its trivial names. From the insertion of the frontal feathers to its anterior end, this sheath measures 0.50. The flaps of the saddle project downward and backward below the tomial line, its anterior margin presenting two curves, convex forward, including one curve, convex posteriorly. The "pommel" part of the sheath projects above the mandible, like a hood, 0.20 inch. From gape to apex the sheath measures 1.00; perpendicular depth 0.70, width of "pommel" 0.30, of sheath between lower margin of flaps 0.45. At the sides the flaps are firmly soldered to the upper mandible, so that, in this species at least, erection of the sheath (attributed to *C. necrophaga* or *C. alba* by Latham, Lesson and Cuvier,*) is impossible. Structurally continuous with the sheath, and extending backward and upward from its posterior portion, is a thick, black, tumid strip of naked skin, deeply pitted by numerous follicular openings, some of which near the edges give passage to hair-like feathers. It lies in contact with the eyelid superiorly, and the portion uncovered by feathers measures 0.55 by 0.30. Upon clipping away the frontal feathers, this black caruncle is found to extend entirely across the forehead, as a squarish frontal hood, covered by white feathers so thickly as to be invisible in its anterior and central two-thirds. Its upper margin (somewhat wider than the lower) is abruptly distinct, just opposite the highest part of the eyelid. The width of the caruncle at its upper and widest part is 1.10; its height from the lowest inser-

* Animal Kingdom, London, Orr & Co., 1849, p. 250.

tion of the feathers is 0.70. As already stated, the sheath is continuous structurally with this caruncular fold, the epidermal tissue of the latter losing its follicles and assuming a horny structure at the wide angle between the forehead and bill. In appearance the structure is strongly suggestive of the frontal papillose casque borne by the turkey* (*Meleagris*). Opposite the central concavity in the sinuous border of the side-flap of the hood appears, uncovered by the sheath, about half the aperture of the nostril, oval in outline, with its long axis nearly parallel with, but inclining slightly toward, the rictus. The nostrils are pervious. The eyelids are thickened and everted, during life of a pale pink, whence the name "sore-eyed pigeon." Iris, dark-brown to black.

The body is full and heavy. When at rest the head is withdrawn toward the body and the tarsi are nearly concealed by the plumage. Plumage universally pure white, remarkably soft and downy. "After-shaft" of body-feathers distinct and soft, measuring rather more than half the length of the main shaft.* Wing primaries 10; first three about of the same length, the second being, perhaps, a trifle the longest. The inner remiges equal the longest primaries. Tail slightly rounded, spreading widely in flight. Rectrices 12, inner and outer vanes of nearly equal width, innermost being rather the wider.

Tibia is naked for 0.40 inch, but covered to below the joint by extremities of feathers. Tarsus is pale flesh-color, 1.70 inch; stout, flattened on its internal surface; narrower posteriorly than anteriorly; covered by prominent hexagonal scales, which merge gradually into scutellations on the toes anteriorly. Middle toe measures 1.5, longest claw 0.45 inch. A strong and distinct row of marginal scales fringes each toe, and a small web connects bases of third and fourth toes. First toe placed at the inner side of tarsus, distinctly above the level of the rest, and with its under surface directed externally. Claws strong, stout, blunt, convex above, concave and deeply grooved beneath; black above, pale horn-whitish below. Joints stout and large.

DISSECTION.

MUSCLES OF THE UPPER EXTREMITY.

Pectoralis major arises from external border of clavicle in its whole length excepting its coracoid enlargement; from the whole length of

* This extension of the caruncular casque across the forehead, being hidden by feathers, has, we believe, never before been noticed, previous descriptions having mentioned only the obviously naked strip along the eye.

lower border and about one-half the lateral surface of carina; and from the posterior and external third of the body of sternum, to be inserted by a broad flat tendon into the palmar margin of the pectoral crest of humerus. The pectoralis major is partly cleft, posteriorly and inferiorly, but the two parts coalesce to be inserted by a single tendon as above.

Second pectoral arises from sterno-clavicular membrane, from the angle between the body and keel of sternum to within 0.25 inch of its posterior end, and from all of the body not occupied by the conjoined segments of pectoralis major. It is inserted by a very long cylindrical tendon, gliding through a tendinous sheath given off from the neighborhood of coraco-clavicular articulation, beneath the angle of their junction, into radial tubercle of humerus, 0.50 inch below its articulating surface. This is the *levator humeri*.

Third pectoral ("*pectoralis minimus*" Coes*) arises fleshy, pyramidal, from external border near superior external angle of sternum and from the adjoining margins of sternum and coracoid, for about one-third their length, to be inserted by a round tendon directly into inner border of humerus, near its head. In origin and function this muscle agrees with *pectoralis minimus* of Coes, and of Owen, 1836 (but not with third pectoral of Owen, 1866, being an adductor and external rotator but *not* a levator of humerus; arising from external border, *not* angle, of sternum; and passing through no trochlear groove, but being inserted by a *straight* tendon into radial tuberosity of humerus, which it depresses, not elevates).

The article in Todd's Cyclop. Anat. describes the third pectoral-substantially as it is here given; but in Anat. Vert., ii, 1866, p. 97, apparently by some oversight, Professor Owen redescribes the third pectoral in much the same terms as he does the second, making it out to be a levator.

Latissimus dorsi shows no peculiarity of origin or insertion. Anterior fibers are a thin narrow band of pale muscle. Posterior are darker, stouter, and blend, before insertion, with anterior. A few muscular fibers pass downward from sterno-coracoid articulation, parallel with sternal ribs.

Extensor plicæ alaris arises from coraco-clavicular articulation, sending its tendon downward along the pectoral ridge of humerus. It is triangular in form, covering the rest of the muscles of the shoulder-joint. Just beneath it lies the—

* Osteology, etc., of *Columbus torquatus*, Mem. Bost. Soc. Nat. Hist. i, 1868.

Deltoides, arising from coracoid end of scapula, filling the space between the tendon of pectoralis medius and latissimus dorsi, to be inserted into the pectoral ridge of humerus.

Biceps presents nothing unusual.

Infraspinatus and *teres major** are represented by a single muscle, which arises from the entire dorsal margin of scapula, and is inserted into the ulnar tuberosity of humerus.

A stout fasciculus of soft, dark muscle, which arises from nearly the whole of the internal surface of coracoid and of the adjoining stout strip of membrane, passes outward and upward through humero-coracoid space to be inserted into the anterior tuberosity of the humerus. Perhaps this is the muscle described by Owen† as the analogue of coraco-brachialis, and said by him to "attain its greatest relative size in the *Rasores*, where it arises from almost the whole of the coracoidium."

Triceps extensor cubiti is divided into two distinct muscles, as usual.

Numerous isolated fibres, representing *platysma myoides*, originate from anterior half of clavicle and proceed upward between the layers of the superficial fascia, to be inserted into the skin, superficial surface of œsophagus, and crop.

MUSCLES OF THE LOWER EXTREMITY.

Sartorius as usual.

Rectus femoris and *tensor vaginæ femoris* (*abductor magnus* of Owen) arise thin and fan-shaped, by a membranous aponeurosis from the superficial fascia of the back and from outer margin of sacrum and ischium, to be inserted by *two* tendons, the uppermost going to the anterior part of the sheath of crureus, the lowermost to the head of fibula. The muscle is very thin and its tendon a delicate aponeurosis.

Glutei and *crureus* (including internal and external *vasti*) present no characters of particular interest.

Biceps arises just above inner hamstring muscle from ischium, and is inserted into fibula, fully 0.8 inch below the knee-joint.

Semimembranosus and *semitendinosus* are inserted into tibia at about the same level, above insertion of biceps.

Adductores and *gastrocnemius* not noted as peculiar.

* *Vid.* Owen, *Comp. Anat. and Phys.*, vol. ii, p. 95. Lond., Longmans, 1866.

† Owen, *l. c.*, p. 97.

The thickening and expansion of the conjoined tendon, just over the posterior part of tibio-tarsal joint, is very marked, adding much to the lever-power of the muscle.

VISCERA.

On removal of sternum and scapular girdle, the ribs being cut through at a short distance from the sternal margins, only trachea, pericardium, and liver became visible, covering in the rest of the viscera. A considerable deposit of finely granular sabulous matter was found upon the serous covering of the lungs and viscera, which was preserved for future examination. There is no sternal fold of trachea, its bifurcation appearing just above *manubrium sterni*. *Œsophagus* lies beneath and to the right side of trachea. It is dilated into a very wide, triangular, definitely-circumscribed ingluvies, which measures in the alcoholic specimen about 1.50 by 1.00 inch.

Proventriculus is but a slight dilatation of *œsophagus*, well provided with secreting glands internally. The glands are cylindrical in shape, and some of them measure quite 0.10 inch in length. They are disposed in a zone of unequal width about the proventricular opening of the stomach, extending very much further upward anteriorly than posteriorly, where the lining of the proventriculus soon becomes reticulated. The orifices of the glands are very large, and their general structure and disposition are clearly visible to the naked eye.

Gizzard is elongated, 1.50 by 0.80 inch. Tendinous centres are situated *laterally*, a band of stout muscle passing downward over the anterior and central portion, spreading out over the bottom of the viscus, and curving sharply over posteriorly as a thick fleshy lip, the margin of which sinks into a deep sulcus, concave superiorly, and extending nearly the whole width of the stomach. From the centre of this sulcus passes upward a stout muscular fascicle, diverging as it ascends so as to cover the posterior surface of the stomach, and its sides above the lateral tendinous centers. The duodenum is given off from the right side, 0.50 inch from the lower border of proventriculus. Internally, the stomach is deeply rugous, the rugæ running for the most part axially, but merging in the upper third into a rough pavement of irregular prominences, produced by transverse sulci crossing the longitudinal. The principal grinding surfaces are, as was to be expected from the external arrangement of muscle, anterior and posterior instead of lateral, as usually is the case. The gizzard contained several pebbles, three as large as a grain of coffee, the beaks of two cephalopods, shells of small patellæ, and a considerable mass of pale green vegetable matter.

The small intestine passes out from the gizzard on the right side, curving sharply backward (parallel to spine) for 3 inches, and returning upon itself to the level of its exit from the gizzard. Within this fold lies the *pancreas*, moulded to the intestine on each side, and quite filling the interspaces of its curved surfaces. It is, therefore, about 3 inches in length, constricted along its central axis, and spreading out along both its ventral and dorsal surfaces. The anterior end is the larger, opposite to which the hepatic and gall ducts empty into the duodenum at least 6 inches from the gizzard. The pancreatic duct was lost in dissection, at a point about half an inch beyond the entrance of the hepatic duct, so that the point at which it empties into duodenum was not accurately determined, but it is certainly below the termination of hepatic duct. The intestine of this alcoholic specimen measures 44 inches in all; that of a fresh specimen, measured in the field, being 48 inches in length.* The caeca, which are quite as large in diameter as the intestine itself, are each 8 inches long, terminating in a mammillar point. From the origin of caeca to anus the distance is 3 inches; 23 inches below gizzard is another small caecal appendage, rather less than 1 inch long.

Pericardium is large and full, occupying the central parts of thorax. A process of the pericardium is produced downward upon and between the lobes of the liver. The *heart* is large, and of the usual color. On each side of the trachea are to be seen the superior cavæ, with their branches, and beneath these lie the carotid arteries, which are double, the left being rather larger than the right. They dip beneath the trachea and œsophagus, converge, lying upon the anterior cervical muscles, run parallel for about half an inch, and divide into branches about an inch and a half above the first rib. The specimen not being injected, we were unable to determine whether or no there is an anastomosis between these arteries. The bifurcation of the trachea appears above the sternum, presenting no sternal fold in this species.

The *liver* is very large, extending on both sides for half an inch beyond the level of the acetabula. Left lobe nearly as large as right. Posteriorly and superiorly, it is deeply grooved by contact with the other viscera; anteriorly, a long-tailed process passes forward and upward, ending in a sort of suspensory ligament; the process of pericardium

* Mr. Cunningham records the length of the intestine of the larger species, *C. alba*, as but 40 inches, the caeca as 7 inches each; distance between their origin and the anus, 2½ inches. (Journ. Anat. and Phys. 1869, p. 89.)

above mentioned being, in fact, though not homologically, the principal suspender of the liver. The posterior margin of the right lobe presents two deep incisions, separating three pointed processes of liver tissue. The left lobe is sharply uniceiform, the concavity of the hook looking upward. A decided thickening of the isthmus, on the superior surface of the liver, indicates the third lobe. Gall-bladder distinct, empty; biliary ducts very large.

The left ovary was found to have been quite active, resembling a bunch of grapes. We counted twenty-six vesicles as large as No. 6 shot, eleven of these being as large as No. 3, besides very many large enough to be distinct.

Oviduct tortuous; much enlarged; longitudinal plicæ very distinct and laminated, like the leaves of a book. The sex of this specimen, which had black wing-spurs, proves that that feature is not distinctive of male birds, as we had supposed.*

Kidneys are large, 1.95 inch; moulded on their superior (dorsal) surface to fit the irregularities of the sacrum. Near the termination of the ureter, in the cloaca, are noticeable two small glandular bodies.

Palate is wide posteriorly, bounded at the sides and anteriorly by the projecting edges of the bill. Half an inch from the tip of beak, in the median line, is a minute longitudinal crest; 0.10 inch behind this a decided tooth-like, bony process, directed backward; 0.20 inch posterior to this are six tooth-like villi, directed backward and arranged, like a comb, in a horizontal row. Here the lateral palatal ridges become prominent. Marking the anterior end of the aperture of the posterior nares, and 0.30 inch behind the last-named process, are two longer tooth-like villi; on each side of this slit, in the sulcus between central and lateral palatal ridges, are six minute separate villi in a longitudinal row. Behind the slit for the Eustachian tube there is a transverse comb-like row of villi on each side, directed backward and limiting the upper and back part of the pharynx.

SKELETON.

SKULL.—On examination of the skull as a whole, the brain cavity appears relatively very large and high. The frontal region is much inflated, and the whole arch very convex. The attachments for muscles are generally not well marked, and the depression (erotophyte) for the insertion of the temporal muscle is almost obsolete.† Prominent points

* B II. No. 2, Nat. Mus. 1875, p. 1.

† These observations are very different from those of Mr. T. C. Eyton on the skull of *Chionis alba*. He found the "cranium with a very small cavity for the brain; occipital

are: two deep fossæ just above and parallel to the superior orbital margins, a prominent bony crest (for the support of the earuncle) in front of these, the large size and subcircular form of the foramen magnum—all of which will be described in detail below.

Occipital bone is convex inferiorly and irregularly trapezoidal in shape. Its crest is less prominent than usual, although quite distinct; shaped like a bow, with its extremities distinctly defined as far as the superior border of the *meatus auditorius externus*. The condyle is small and spherical (not nicked, as in *Gallinæ*). *Foramen magnum* is nearly circular in outline, its anterior border being cut off so as to form a high, broad arch. It measures in antero-posterior diameter 0.21, in transverse diameter 0.32 inch. On each side of the condyle is a broad space for ligamentous attachments; laterally and posteriorly to these its paroccipital(?) portions extend downward as vaginal processes, protecting the posterior border of the external auditory meatus. From the foramen magnum to the crest extends upward a prominent median ridge, flanked by lesser ridges on each side from the lateral portions of the foramen.

Sphenoid is irregularly pyramidal in shape, being produced forward into a long cultrate spine (*basisphenoid*), embraced by the two prongs of the *vomer* and upon which ride the *palatine* and *pterygoid* bones. There are no distinct basiptyergoid processes. Only the marginal portions of the basisphenoid contribute to the floor of the orbits, its orbital plates passing upward and outward to complete a septum between the brain and orbit. This septum is perforated in the median line by two irregular foramina for the transmission of the optic and olfactory nerves. The inferior (optic) foramen is heart-shaped, the apex of the figure being directed upward, and the lateral lobes much prolonged. The superior (olfactory) foramen presents the outline of the ace of clubs. As these are the chief anterior foramina of the brain-case, they probably transmit other nerves distributed to the orbit and face, as well as the olfactory and optic. Rising from the superior margin of the basi-sphenoid is the *inter-orbital septum*, perforated anteriorly in this species by an irregular vacancy, and posteriorly by an extension forward of the optic and olfactory foramina already noted. The interorbital septum is, however,

ridge very prominent; * * * * ridges for the attachment of the masseter muscles strongly marked." (*Osteologia Arium*, London, 1867, p. 176.) As we cannot believe there is any marked difference in the skulls of *C. alba* and *C. minor*, we simply fail to appreciate the pertinence of the author's remarks in this case.

properly speaking, incomplete only as regards the irregular foramen above mentioned. It is marked anteriorly by prominent stout bridges of bone, disposed so as to form the letter Y, which are continuous apparently with the notable exostosis marking the anterior portion of the frontal bone.

Parietal and *temporal* bones are not distinctly limited, owing to the complete ossification of the brain-case. The external auditory meatus is large, and so well protected by its surrounding periotic processes as to seem to be almost a tubular prolongation of the skull.

Os quadratum is in shape somewhat like a molar tooth, its crown being directed downward, and one fang (*i. e.* orbital process) projecting upward, forward, and inward nearly to the body of the basisphenoid. It presents five articulating facets; one inferior, broad, triangular, and marked by three marginal mammillæ, for the mandible; one external to and a little above this, for the zygoma; two, on its upper surface, for articulation with the temporal; and one, internal to these, for the pterygoid.

Pterygoids are relatively slender, 0.32 inch long, flattened from side to side, and slightly twisted upon themselves. They diverge from the palato-ptyergoid articulation at an unusually wide angle, rather more than 90°.

Vomer is long, slender, bifid posteriorly, apparently extending from pterygo-palatine articulation to beyond the anterior extremity of the *maxillo-palatines*. Its complete ankylosis with the palatines, however, renders it impossible to determine exactly its posterior limit. Its superior surface is deeply channeled for its whole length. Beneath the vomer are to be found the *maxillo-palatines* and *palatines*, the latter soldered together on each side, but quite separated in the middle line.

Palatines are thin laminae, irregularly concavo-convex. They present two prominent laminae, external and internal. The external, which constitutes most of the bone, flares widely outward and downward, ending behind transversely, yet with a gently-rounded angle. From its under surface descends obliquely inward the much smaller internal lamina, like a keel.

Maxillo-palatines.—These bones are rather stout, squarish, tumid bodies, anteriorly joining the palatines at a point, but in all the rest of their extent entirely separated therefrom, as they also are from the vomer and from each other. The "body" is a very thin osseous wall, inclosing a hollow cavity. Anteriorly the *palatines* are produced as maxillary

processes to form the lateral borders of the palate and part of the osseous support of the basal portion of the bill.

From these accounts it appears that the palatal structure, as a whole, is what Huxley calls *schizognathous*.

Frontal bone is marked by two very distinct deep fossæ, occupying nearly the whole roof of the orbit, separated from one another by a prominent central ridge, and bounded anteriorly by a curious exostosis, which supports the fleshy caruncle of the forehead. The floor of this fossa is perforated by an anterior large circular foramen, transmitting the nasal duct of the gland which occupies the fossa. Behind this are several irregular perforations, disposed in a line parallel with the orbital margin. This last (the orbital margin) extends horizontally as a thin lamellar process, completing the roof of the orbit on each side. The remarkable exostosis above referred to may be described as consisting of two prominent bosses, one on each side, separated by a shallow central fossa, and presenting somewhat the outline of a bat with wings extended. From the external portion of each "wing" runs downward, parallel with the nasals, a slender bone (*maxilla*), articulated above by an expanded condyle, joining, below, the rest of the maxilla at the base of the bill. A narrow linear space is left between these bones and the nasal on each side. The construction of these parts is what Garrod calls *schizorhinal*.

Zygoma or malar bone is long (1.00 inch) and slender, of uniform diameter throughout, extending from the *os quadratum* to the base of the bill. It diverges rather widely from the middle line, the distance between its posterior attachments measuring 1.00 inch. *Lachrymals* are distinct, although small, easily detached, and liable to be overlooked. They are crooked little nibs of bone, with beveled base of support.

Mandible expands posteriorly into a flat articulating head, marked superiorly by a deep, irregularly concave glenoid cavity. On the internal side of this projects upward, and a little inward, a stout pyramidal process, slightly hooked toward its apex. Directly behind the articulation projects the *angle of the mandible*, a lamellar rostrum, nearly square in outline and very slightly canted upward; 0.15 inch in diameter. Externally there is a low pyramidal prominence, its apex filling the angle between zygoma and *os quadratum*, at their articulation. The body of the mandible is continued forward to the symphysis as a thin strip of bone, flattened from side to side, and sending upward a very thin lamella from its external surface to complete the contour of the bill. At

about the middle of the mandible, this lamella is incomplete, leaving a long, oval foramen, parallel to ramus, measuring 0.40 by 0.10 inch.

General measurements of skull.

| | Inches. |
|--|---------|
| Occipital crest to tip of bill..... | 2.60 |
| Occipital crest to fronto-maxillary articulation..... | 1.40 |
| Width of skull at base..... | 1.00 |
| Width between meatus auditorii..... | 0.42 |
| Extreme length of brain case..... | 1.00 |
| Extreme height of brain case..... | 0.75 |
| Width of frontal crest..... | 0.80 |
| Height of frontal crest, middle line..... | 0.50 |
| From fronto-maxillary articulation to tip of bill..... | 1.40 |

The length of the symphysis is about one-fourth that of the entire mandible.

VERTEBRÆ.—*Cervical* are thirteen in number, differing considerably in shape. The second, third, and fourth show a distinct and prominent neural spine, which becomes very small on the fifth, and can scarcely be said to exist at all on the others. The second, third, fourth, ninth, tenth, eleventh, and twelfth present also very prominent laminar hypapophyses, which are not developed on the others. The bodies of the first four are very short, rapidly lengthening to the ninth, which is the longest, and again diminishing to the thirteenth, which is about as long as the fifth. All the cervical vertebræ but the atlas present large and distinct vertebral foramina, narrowing gradually toward the skull. The arteries which pass through these would seem to be of unusual size, since the bodies of the vertebræ are deeply grooved beneath for their reception. Rudimentary ribs are distinct on the last five cervical vertebræ, as uncinate processes directed downward and backward from the extremities of the transverse processes. They are less obvious farther up the neck.

Dorsal are eight in number, each carrying a rib, of which all but the first and last articulate also with sternum. Each rib articulates both with the body and transverse process of its vertebra, leaving a space between its tubercle and head, which completes a morphological continuation of the vertebral foramina. From the third to the eighth inclusive the dorsal vertebræ show very prominent lamellar neural spines, forming, by their apposition end to end, a continuous thin perpendicular ridge, which projects above the dorsum of the bird. The bodies of the fourth and fifth are much compressed and flattened from

side to side, making a semblance to a series of prominent lamellar hypapophyses along this part of the column. The transverse processes also of all except the first dorsal are very thin and broad, projecting as a series of flat tiles above the heads and tubercles of the ribs. The last dorsal lies between the crests of the ilia, beneath and abutting against which the rib which it bears comes out. The *sacro-lumbar* vertebræ, *i. e.*, those which are anchylosed with each other and which articulate with the pelvis, appear to be thirteen in number. Viewed from above, the broad, expanded portion of the sacrum (opposite the acetabula) shows six inter-trabecular spaces, the contour of the exposed surface being approximately diamond-shaped, about $\frac{3}{4}$ inch broad at the widest part by $1\frac{1}{8}$ inches in length. The median line above is flat, without indication of spinous processes. Viewed from below, the conjoined centra of the *sacro-lumbar* vertebræ are a narrowly fusiform mass, broadest about opposite the middle of the ilia. Inferiorly they are flattened and somewhat excavated, though anteriorly pinched together and deepening to join the articulation with the last dorsal vertebræ. The trabeculæ are longest and most distinct opposite the acetabula, two of them being especially prominent, while anteriorly four or five are conspicuous. Then follows an interspace of about the same length, in which they nearly disappear; nor are they strongly marked toward the posterior extremity of the column.

The *caudal*, *i. e.*, unanchylosed post-sacral vertebræ, are nine in number, considering the pygostyle as one. Pygostyle is simply laminar, with thickened under edge, irregularly quadrilateral in shape; long diameter, $\frac{1}{2}$ inch. Of the other vertebræ, the transverse processes of the intermediate ones are shorter than those of either extremity. Moderate neural spines, with no obvious hypapophyses except on penultimate vertebra. The whole series presents no special characters.*

* Comparison with De Blainville's vertebral formula will show several points to be considered.

In the first place, De Blainville is in expressed doubt as to the number of post-sacral vertebræ, and his formulae, as given at p. 102 and at p. 106, differ with each other, the first being $15-6-14-7=42$, the other being $15-6-14-8=43$. Accounting for this discrepancy on the supposition of imperfection of his specimen, we throw the post-sacrals out of further consideration, and turn attention to the remaining elements of his formula, which are really less different from ours than appears at first sight, we giving $13-8-13$, and he $15-6-14$.

For we reckon the last costiferous vertebra as dorsal, he as sacral. This leaves the numeration of non-costiferous anchylosed lumbo-sacrals the same, namely, 13, in each case, adding one to his numeration of dorsals. We furthermore reckon as a dorsal

Sternum measures 2.40 inches by 1.20 at upper borders, and is therefore exactly twice as long as broad. (Others measure 2.5 by 1.3, No. 328; 2.42 by 1.20, No. 232.) The manubrial process projects slightly in front of anterior border, sending downward a small, thin beak-like process. Articulating surface for coracoid extends from external and posterior margin of manubrial process, nearly meeting its fellow above it backward and outward, to an angular prominence on the ridges limiting sterno-coracoid articulation .80 inch from the manubrial process. When the coracoid has been removed, the anterior margin of sternum is nearly transverse, showing only a shallow curve upon each side. The costal process projects laterally beyond lateral margins of sternum 0.22 inch, and behind coracoid articulation. There thus presents on each side a triangular space, defined in front by the ridge limiting sterno-coracoid articulation, its base occupied by a grooved facet for coracoid, and its two other sides constituted by the horizontal and lateral margins of the costal process.

The ridge limiting sterno-coracoid articulation inferiorly is prominent and sinuous—bow-shaped. It extends nearly to lateral margin of sternum, which is a thickened ridge, bearing facets for the articulations of ribs on its flattened wide edge, and passing upward to join costal process at nearly a right angle. Costal process is flat and obtusely pyramidal in shape. It projects upward and outward, and covers the posterior aspect of sterno-coracoid articulation. Body is slightly constricted at its middle part, where it measures 1.00, expanding again posteriorly to measure 1.40 inches from apex to apex of its external laminae. Posterior border is convex, the xiphoid process being cut off transversely. The posterior border is deeply incised on each side by two notches, of which the inner measures .40 and the outer .45 in depth, measuring from the curved margin indicated by the extremities of the intervening strips of bone (hyposternal elements of Owen). The outer notch is thus *a little deeper* than the inner, yet, owing to the convexity of the posterior borders of the lateral parts of the sternum, the two laminae limiting the notches are almost exactly of equal length. The margins of the lateral sternal elements are thickened, as already stated, becoming stoutest in the area

that vertebra which bears a distinct, though small and asternal, rib. Removing this disputed one from his cervical series, and adding it to the dorsal series, gives the eight dorsals we enumerate. The only discrepancy, in total numeration of cervical, dorsals, and sacro-lumbars, between his count (35) and ours (34) is one cervical. There being certainly but thirteen cervicals in our specimens, *C. alba* must possess one more cervical than *C. minor*, unless De Blainville miscounted.

occupied by the articulations of sternal ribs, about junction of anterior and middle thirds. Here the ridge is re-enforced by the thickened line, limiting externally the area of origin of pectoralis medius. At the posterior edge of costal process it bifurcates, becoming continuous on the one side with the ridge limiting coraco-sternal articulation, and with the external and posterior margin of the costal process on the other. The area occupied by the origin of pectoralis medius is the thinnest part of the bone. *Keel* begins strictly at apex of manubrial process, whence a sort of beak is given off, its margin looking downward and backward for 0.30 inch. Then follows a sharp angle, with a quite deeply excavated curve, backward, downward, and forward again, to the most prominent part of the rostrum. The anterior border of the keel is therefore quite deeply concave, and its anterior extremity pointed. Its inferior border is slightly convex, and runs backward and upward, bifurcating at its extremity to join the angles of the expanded gladiolus. It measures along its curve 2.1, and at its deepest part, opposite the anterior angle, 0.80 inch. Its anterior border is much thickened by a stout ridge, proceeding backward and downward from the internal angle of sterno-coracoid articulation.

Coracoid measures 1.30 inches in length, and consists of a subcylindrical shaft and two expanded extremities, bearing three articulating facets. The scapular extremity is produced upward and forward, terminating in a prominent facet for the articulation of the clavicle. This articulating head arches over inward, so as to constitute, by aid of a coraco-scapular ligament, a considerable foramen continuous upon the coracoid with a deep groove which runs down upon its lower face, and is bounded by a ridge of bone internally. Three-tenths of an inch above and behind the anterior end of the coracoid is a broad articulating surface, extending entirely across the posterior face of the bone, for the scapula. At the external junction of scapula and coracoid is the glenoid cavity. The shaft of coracoid is inferiorly convex, superiorly flat, and toward its posterior end slightly concave. It sends off a remarkable sickle-shaped spine from the outer side of its posterior head, which curves slightly upward and extends just to the extremity of the costal process of sternum. Internally to this, on its posterior margin, is a triangular spine, extending backward, which fits into a corresponding depression in the ridge limiting sterno-coracoid articulation. From this spine the articulating facet extends inward, arching upward at the same time, and measures 0.40 from without inward. Including the external spine above referred to, the bone measures .63 across its base.

Scapula is long and sword-shaped. It is flattened from before backward near its articulation, and from side to side from its middle third outward, being slightly twisted upon itself. It articulates with the coracoid by a broad oblique head, marked posteriorly by three prominences, and measures 2.10 inches in length by an average width of 0.15 inch.

Furculum is moderately stout, **U** instead of **V** shaped, its sides at first parallel, then curving gently toward each other. It runs backward, with little downward inclination, and its apex is directly beneath the *manubrium sterni*, falling far short of the apex of the sternal keel. There is no prominent process at the union of its two elements, only a small mass of bone, facing the manubrium.

Ribs are eight in number, of which all but the first and last articulate with sternum. Splint ribs are distinct, averaging 0.40 inch in length, slightly curved, pointed, and directed obliquely upward and backward; but we cannot say how many there are, owing to the carelessness of the person who boiled the subject.

Humerus measures 2.70 inches in length; a slender bone, slightly curved, like an italic *f*. Its head is much expanded and flattened from without inward, covering the region of the joint as with a shield, convex externally, concave internally. It is marked by many deep grooves and depressions for muscular attachments, and by a very prominent ridge along its dorsal surface, whereto are attached the tendons of the pectoralis major and minor, latissimus dorsi, and scapular muscles.

The forearm is slightly longer than the humerus, measuring 2.9 inches from elbow to wrist. The *radius* measures 2.70 inches, and the *ulna* 2.80 inches. Both bones are rather stout for their length. Just below the carpal joint is given off from the radial side of the carpus a prominent exostosis, knob-shaped, 0.30 inch long by 0.20 inch wide at the base, growing out perpendicularly to the axis of the bone. This knob supports the wing-spur, is undoubtedly bony, but presents no recognizable evidence of independent ossification. The principal bone of the metacarpus, that representing the middle finger, carries two phalanges, measuring together 1.20 inches. To its ulnar side is attached at each end the metacarpal bone of the fourth finger, which acts as a splint-bone, being quite separate excepting at its extremities. This fourth metacarpal carries but a single phalanx. The radial metacarpal is a small spicule.

Femur measures 2.1 inches in length. Trochanter is flattened so as

to protect the joint externally, and rises above the margin of acetabulum.

Tibia is much longer than femur, 3.30 inches. Its head is much expanded, with a very prominent anterior flattened process, triangular in shape and curved slightly outward.

Fibula is distinct above; united to tibia by a thin, bony bridge along the middle part of its course; becoming free again as a very slender rod, which is finally fused with tibia at about its center, and quite lost an inch above its tarsal extremity.

Tarso-metatarsus terminates in three double condyloid facets, claw-like, partly separated. The outermost is shortest (highest), the middle longest, and the innermost one intermediate in length. About one-tenth of an inch above the junction of the middle and innermost elements is a foramen quite through the bone from before backward, and about large enough to admit an ordinary pin. From the head to the end of the middle division of its lower part the bone measures 1.75 inches, to the inner division, 1.65, and to the outer, 1.50, inches.

Toes are four in number. The first toe, articulated to the metatarsus above the level of the rest, has two elements. Its accessory metatarsal is very short. The second toe, articulating with the inner condyle, has three elements, successively diminishing in length. The third toe has four elements, similarly diminishing; and the fourth toe has five, of which the first is longest, the second and fourth next and equal, the third next, and the fifth shortest.

Pelvis is long, compressed anteriorly in the middle line of its dorsal surface, expanded posteriorly, and diverging so as to include the sacrum. The crests of the ilia extend so far forward as to cover the articulation of the last rib, and are separated in the middle line only by the lumbar neurapophyses, to which they are closely apposed, being turned up to form a sheath. Eight-tenths of an inch from the anterior margin of the pelvis the ilia begin to diverge, inclosing a hastate interval, which is filled up by the sacrum. Here the dorsal surface of the ilia becomes convex (from concave), presenting a well-defined, smooth surface for the origin of the gluteal muscles. Posteriorly, the ilium ends in a sinuate border limited externally by a prominent ridge, which terminates posteriorly in a considerable spine, the tuberosity of the ischium. The *acetabulum* is perforate, protected posteriorly and superiorly by a prominent bony lip, which separates it from the ischiatic foramen. Between the ischiatic foramen and the acetabulum, and inferior to both, is the obturator

space, limited below by the pubis and above by the ischium. It is converted during life into an oval foramen by a stout ischio-pubic ligament. The ramus of the ischium runs downward and backward as a long falcate process, flat, thin, and curved on the flat somewhat inward. The *pubis* is long, very slender, shaped like an italic *f*, and crosses the ischium externally to its ramus, extending 0.40 beyond it, curving inward as it passes backward. Both ischium and pubis extend considerably beyond the coccyx posteriorly, and approximate each other, inclosing, with ilium, an irregular, circular outlet, of which the sacro-pubic diameter is 1.30 and the inter-ischiatric 1.10 inches. Internally the ilia are deeply excavated opposite the sacrum for the kidneys, so that the acetabular and ischiatic foramina pass out *laterally* from the cavity so formed. Its roof is crossed by the sacral trabeculae, and encroached upon by the sacrum, somewhat like the ridge-pole and lateral ties of the roof of a house. This iliac cavity is limited anteriorly by the margin of a ridge formed by the fusion of the ischium and pubes. Posteriorly, although the rami of the ischium do not articulate or fuse together, they *touch*, doubtless closing during life the whole obturator space, here very long and narrow.

STATEMENT OF CONCLUSIONS DEDUCED FROM THE FORE-GOING.

HABITS, GENERAL APPEARANCE IN LIFE, AND EXTERNAL CHARACTERS.

The observer is first struck by the strong resemblance which *Chionis* bears to the pigeons, in general appearance, gait, and mode of flight. The general shape of the body is of an ordinary columbine character, the head being notably small, as usual in that group, the neck short and full, and the body plump; the tail, moreover, having but 12 rectrices. The sheath of the bill may furnish a distant analogy with the soft, swollen membrane which covers the nostrils throughout the *Columbae*. But this is a mere resemblance, the affinity indicated being, as will be seen later, with such sheaths as the *Procellariidae* and especially *Lestridinae* bear. The strongly convex outline of the frontal feathers at the base of the upper mandible is a very decided columbine feature. These superficial resemblances to *Columbae* are not correlated with more important structural characters, and are themselves overbalanced by other external features, which indicate relationship with other groups. Thus the pterylosis is entirely different, large after-shafts and abundant down

being present. The pterylosis stops above the suffrago; the inner remiges reach to the ends of the primaries in the folded wing. As to the exterior portions of the body not covered with feathers, the feet are entirely different from those of the pigeons, in the shortness and elevation of the hallux and other features, while the bill, aside from the sheathed portion, is altogether diverse. The reference of this form, therefore, to, or even near, the *Columba* is out of the question.

The only external character indicating a *passerine* affinity is the form and size of the beak, which are decidedly corvine; an analogy which, however, is as feeble as that deduced from the croaking note of the bird when on its feet, and has, of course, no taxonomic significance.

The external resemblances to the *Gallinæ* are much more obvious and important. The contour-feathers have large after-shafts—at least half as long as the main shafts. There is a curious gallinaceous trait exhibited in the mode of holding the wings during life—drooping and parallel with the tail instead of meeting each other above it. The frontal caruncular casque presents an obvious resemblance to the combs which ornament so many of the typical *Gallinæ*. The few tail feathers and contour of those of the forehead are, however, columbine rather than gallinaceous, while the elongation of the inner remiges and general shape of the wing is rather grallatorial. The feet, in almost every particular, are thoroughly gallinaceous, even to the character of the marginal fringe of the toes, which retains strong pectinations instead of presenting the smooth border characterizing the feet of many of the *Grallatores*. The points in which the feet differ from those of most *Gallinæ* are: The reticulation instead of the anterior scutellation of the tarsus, and nakedness of the lower portion of the tibiæ; both these features being essentially grallatorial, though shared by the gulls. As to other naked portions of the body: The presence of the wing-spur indicates affinities lower than the *Gallinæ* so far as it has any taxonomic value, such spurs being a rare accident of higher (*i. e.*, more recent) birds, and its development being most pronounced in older, more generalized types—struthious birds, for instance. The abundance of gray down is an indication of relationship with pelagic birds, and by so far removes the bird from the neighborhood of *Gallinæ*. The legs are altogether below the average grallatorial length, and the small extent (one-half inch) of the unfeathered part of the tibia seems to assimilate it, as De Blainville has observed, with the gulls. The system of coloration also is extremely gull-like. The bird, in fact, closely resembles super-

ficially *Pagophila cburnea*, or *Pagodroma nireca*. The thoroughly anomalous bill offers nothing of interest in this connection. On the other hand, the bird's omnivorous diet, habits under confinement, easy domestication, dislike of water, entire inability to swim, and many other points in its habits, are strongly gallinaceous characteristics, by so much removing it from the vicinity of either grallatorial or natatorial birds.

Proceeding to consider the relationships of *Chionis* with *Grallæ* as to external features, the following points present themselves: A small, flat, twelve-feathered tail, a wing with the inner remiges equaling the longest primaries, a tibia bare below, a completely reticulate tarsus. These are all grallatorial features. As to other indications to be afforded by external characters alone, we should not omit to refer to a struthious feature already noted by W. K. Parker (Trans. Zool. Soc., vol. v, p. 207) in the following terms: "There are certain curious, thoroughly *marine* plovers (*Chionis*), in which the sheathing of the upper jaw is very perfect. They thus retain a struthious character, but in an exaggerated condition."

Upon one point which we consider important, the required data are wanting. We refer to the nature of the bird, whether altricial or præocial. The now well-known egg itself has been perhaps hastily considered to be decidedly pluvialine; yet, for all we can see, it is quite as thoroughly larine. Now, as we shall see beyond, the relationships of the bird are nearly balanced between the plover-snipe and the gull-petrel groups. If *Chionis* lays regularly four eggs, and if the young run about at birth, this would be a great argument for De Blainville; if it lays two or three eggs, and rears its young in the nest, the boot would be on the other leg.

In summing external characters, therefore, we see how exactly *Chionis* stands between grallatorial and natatorial birds, retaining slight but perfectly distinct traces of several other types of structure.

Inasmuch as M. de Blainville is the only naturalist who has made any careful study of this genus (based upon specimens of *C. alba*), and as his conclusion that its nearest affinities are with *Hæmatopus* have never been formally disputed, it seems proper to consider here the external features upon which this distinguished naturalist based his deductions.

In the first place, De Blainville labored under the disadvantage of never having seen a specimen of *C. minor* (it had, indeed, not been dif-

ferentiated at the time of his description) which we regard as clearly the type species of the family. Secondly, the description of the living bird to which he had access related only to individuals observed under the unnatural conditions of confinement on shipboard, which may account for the discrepancies between his and our descriptions of its habits, and tends to invalidate the conclusions which he draws therefrom. While he has stated fairly and accurately many of the resemblances to *Hematopus*, or in other words to *Grallatores*, he seems to us to have failed to give due weight to the many important points of difference from that family, some of which we have already discussed, and others of which will appear in a stronger light as we proceed to examine the internal structure.

MUSCULAR AND DIGESTIVE SYSTEMS.

The muscular system affords less important and decisive indications than either the digestive or osseous. According to our dissections, the general disposition of the pectoral muscles which act upon the humerus is, as would have been anticipated from the mode of flight, rather gallinaceous than grallatorial. This statement is borne out by the relative development of the several pectorals, the bulk and extensive origin of a "*coraco-brachialis*" (see page 94), and a specialization of a sort of *platysma myoides* with reference to its action upon a large crop. A tolerably minute description of the more important muscles has been given on a preceding page as material for further comparisons than we are at present prepared to undertake.

In the digestive system we meet at the outset with several gallinaceous characters. The breadth of the mouth, especially near the base of the bill, shape of the tongue, and general disposition of the several palatal and lingual appendices, are rather those of a gallinaceous than of a grallatorial bird. In the shore-birds, among which *Hematopus* falls, narrowness of the bill and constriction of the whole buccal cavity is a very distinctive feature. The slender œsophagus of *Chionis*, much narrower than is usual in shell-eating birds, presents the extremely rasorial feature of a large and circumscribed crop. The proventriculus is not a marked dilatation of the œsophagus. Its solvent glands differ widely from those of the *Galline* in their simple structure, approaching, in this respect, to those of various water birds, such as the swan and gauntet. But the low taxonomic value of this feature is illustrated by the marked differences exhibited by those of so nearly related birds as the swan and goose, for example. No greater value attaches to the disposition

of the zone of glands as a whole, since it varies widely in closely-allied genera.

The gizzard appears to be unique, so far as we know, in the antero-posterior, instead of lateral disposition of its masses of muscle. The development of muscle is intermediate between the great masses found in the *Rasores* (and such *Natatores* as the goose) and the less considerable layers found in *Grallatores*, but altogether different from the thin membranous bags of fish-eating birds like gulls. The length of the intestine (about three times that of the bird), and its calibre, do not differ greatly from the same characteristics in *Rasores*. The caeca are very long, and dilated toward their blind ends; in this respect totally unlike the grallatorial type, in which the caeca, when present, are commonly small and simple.

The third caecum, of uncertain significance, is distinct, although small. This appendage is found in various grallatorial, some struthious, and many other birds. On the whole, it is safe to say that the digestive canal is decidedly rasorial in character.

OSSEOUS SYSTEM.

From a decided position among *Gallinae*, on the other hand, certain parts of the skeleton exclude this bird as effectually as the existence of a sternal keel renders the consideration of struthious affinities unnecessary in this connection. The sternum departs furthest from that of a struthious bird, and next most widely from the very peculiar rasorial form. The most cursory inspection throws out at once the deeply-cleft, strongly specialized sternum of gallinaceous birds. It is of a very simple generalized type, presenting characteristics to be found in widely diverse groups of birds, but on the whole resembles most closely the commonest form of the sternum of the *Laridæ*, with a marked likeness also to the breast-bone of a plover. The obvious resemblance of this bone to that of *Hematopus* is the central point of De Blainville's argument. Yet we are inclined to believe that the sternal characters upon which De Blainville most relies as distinctively pluvialine are simply the most generalized features of the bone—those which, under various modifications, are to be found in the greatest number of different groups. And simple comparison shows beyond dispute a greater resemblance of this sternum to that of the gulls than to that of wading birds.

The general form, the existence of a prominent manubrial process, the width and extent of the costal margins, the great prolongation of

the costal processes, the development of the keel relative to the size of the body of the bone, the general disposition of the coraco-sternal articulation, and the doubly-notched posterior border, are all thoroughly gull-like. The point of difference of this sternum from that of the gulls, is a moderate rounding of its posterior margin, so that the outer of the two spurs of bone does not reach so far back as the inner; the reverse being the case in *Laridae*. Such form of the posterior margin is a common grallatorial character; nevertheless, in *Limosa*, for instance, this border is perfectly transverse. Moreover, the difference between *Chionis* and *Larus* in this respect is less than the difference between *Larus* and its near neighbor *Lestrís*. In the wading birds the manubrium is either absent or quite small, the keel is very deep in proportion to the extent of the body, and the body is compressed anteriorly, and very deeply hollowed. As to all of these features, the sternum of *Chionis* differs from that of the plovers and approaches that of the gulls. In comparison with either plovers or gulls, there is a feature peculiar to *Chionis* in the relation borne by the furculum to the sternum. For both gulls and plovers have a strongly bent furculum with a well developed posterior spine reaching nearly to the apex of the sternal keel; whereas, in *Chionis* the furculum is scarcely bent, has no spine whatever, and its apex is closer to the manubrium than to the sternal keel. In place of a posterior spine there is a slight process of bone directly facing the manubrium.

The clue to the true affinity of the bird furnished by these gull-like sternal characters, is traceable in every part of the skeleton.

To begin with the skull. The *Gallinae* may be at once thrown out of the discussion by the absence in *Chionis* of the following, among other, distinctively "*alektoromorphic*" features.* The occipital condyle is simple, not notched; there are no basipterygoid facets, the pterygoids articulating with the basisphenoid only at their extremities; the internal lamellæ of the palatine bone are strongly developed instead of rudimentary; and the shape of the palatines, as a whole, is radically different. The maxillo-palatines are long and spongy, instead of being lamellar. Vomer is large, conspicuous, and completely ankylosed with the palatines. The articulation of the quadrate bone with the temporal is very different, nor is there in front of this bone the immense fenestrated process so conspicuous in *Gallinae*. The angle of the mandible is not strongly upcurved. There are great pits on top of the skull for the

* Huxley on Classification, P. Z. S. 1867, p. 459.

lodgment of the nasal glands not seen in *Gallinæ*. In fact, the curious frontal bosses found on some cocks are one of the most obvious points of resemblance, aside from the fact that the palates of both are *schizognathous*; but a fortuitous exostosis like this has, of course, no classificatory significance.

On the other hand, every important feature of the skull is identical with the characters presented by the skull of the gulls. So perfect is the resemblance that after careful comparison the principal discrepancy between the two skulls that we are able to detect is the wider divergence of the pterygoids from each other, and the consequently more posterior position of the palato-ptyergoid articulation in the skull of *Chionis*. The most trifling details of the gull's skull are repeated in that of *Chionis*. It is needless to enumerate them. There is, however, a character of uncertain value in the front of the gull's orbit, where a strong transverse plate of bone projects, bounding the orbit anteriorly; no such formation being found in *Chionis*, wading, or gallinaceous birds. As to the angle of the mandible, it is found to be in *Chionis* essentially as in the gulls, yet with a slight production posteriorly, much like that found in some wading birds. In general, the slight differences observed between the details of the skulls of *Chionis* and gulls are differences of degree only; a less development of bony ridges and processes, a greater relative breadth, and less forcible expression of differential details. The difference in the form of the rostrum, which is likely to attract attention, is of no significance whatever, since extraordinary differences in this respect are found among the *Laridæ* themselves (*cf. Rhynchops, e. g.*).

Nitzsch first, from consideration of the pterylosis alone, and Huxley subsequently, with reference to the skeleton, have demonstrated a very close, although not generally recognized, connection between the great plover-snipe group and the gulls; and in discussing the affinity of *Chionis* to the gulls, we might be supposed to imply nearly or quite as intimate relationship with the plovers. But in *Chionis* we miss precisely those characters which are relied upon to distinguish the plovers from the gulls, namely, an extensive naked space above the suffrago as regards pterylosis, and the presence of distinct basi-ptyergoid processes as regards osteology. Furthermore, plovers do not possess the great pits on top of the skull which are so conspicuous in *Laridæ* and in *Chionis*, their rostrum is slender and elongate, their maxillo-palatines are never swollen or spongy (as in *Chionis*), and the angles of their mandibles are produced into slender recurved processes.

Throughout the skeleton, minute and careful comparison, bone by bone, shows only close similarity between *Chionis* and the gulls, as great as that already signalized in treating of the skua. In short, had we only the skeleton of *Chionis* to go upon, we should be obliged to place the genus in *Laridae*; its peculiarities being less widely diverse from those characterizing that family than are to be found within the limits of the family itself.

We thus find in *Chionis* a connecting link, closing the narrow gap between the plovers and gulls of the present day. In our opinion, this group represents the survivors of an ancestral type from which both gulls and plovers have descended. And this opinion is strongly supported by the geographical isolation of its habitat, affording but few conditions favorable to variation.*

In the practical matter of classification, it is evident that *Chionis* is not exactly referable to either of the two groups between which it stands. A consideration of its external characteristics, its digestive system, or its osteology, solely, would lead to very widely diverse conclusions. For we have presented in this bird a genus with the general appearance, gait, and flight of a pigeon, with the beak and voice of a crow; with the habits of a wader, yet dreading the water, and with the pugnacity and familiarity with man of a rasorial bird. With the last group its digestive system would certainly place it, to say nothing of the long after-shafts of the feathers. And osteological comparison establishes its position definitely between the gulls and plovers, but rather nearer to the former.

* It is interesting to note in this connection that the fauna of Kerguelen Island is rather remarkable as containing several forms of animal life whose structure would give no clue whatever to their habits, so aberrant has been the progress of their variation in the peculiar conditions under which they live. Thus the great southern skua (*Buphagus skua antarcticus*, Bull. No. 2 Nat. Mus., p. 11) has there adopted the habits of a land-hawk; three very remarkable genera of apterous *Diptera* occupy the place and live the life of leaf-eating and carnivorous beetles; and the only beetles found by Dr. Kidder were curculios (in a country without trees or shrubs), and a small water-beetle (*Oethebius*), living at a distance from any body of fresh water. The curculios lived upon the rocks and moss, and had lost their northern habit of simulating death, while one genus of apterous *Diptera* had taken up the habit, and lived upon the leaves of the largest plants there represented. Several orders of insects, including *Hymenoptera*, *Hemiptera*, *Orthoptera*, and *Neuroptera*, among the commonest elsewhere, are here entirely absent; so that those which are represented are placed among altogether anomalous surroundings. As Latreille has said (Hist. Nat., vol. xi, p. 51), "La nature en général a un certain nombre de modèles qu'elle reproduit avec des modifications dans tous les classes, et même dans les ordres."

Such distinctive characteristics, amounting almost to anomalies, certainly appear to us to be of a super-family value; equivalent in taxonomic importance to those upon which the groups which Professor Huxley has characterized by the termination “-morphæ” are founded. Much of the discussion which *Chionis* has occasioned has grown out of the tacit assumption that it was merely a genus or family, which *must go somewhere* in a pre-established system; the fact being simply, that it is a member of no recognized group, and must consequently alone constitute one of super-family grade.

Such a group, therefore, we propose to establish, upon the following combination of characters:

CHIONOMORPHÆ.

Palate schizognathous; no basipterygoid facets; divergence of the pterygoids greater than 90°; maxillo-palatines inflated or spongy, not laminar; angle of mandible not hooked; nasals schizorhinal; marked supraorbital fossæ.

Furculum without a spine; its apex nearer manubrium sterni than the point of the keel; a small bony process over its symphysis, facing manubrium. Osseous system thoroughly Larine.

A definitely circumscribed crop; a strongly muscular gizzard, the muscular masses being antero-posterior instead of lateral; very long cæcal appendages. Digestive system generally resembling that of the Gallinæ.

Contour-feathers with well-developed after-shafts; abundant gray down-feathers; tibiæ naked below; rectrices 12; inner remiges equalling the longest primaries; outline of frontal feathers convex.

Beak corvine, peculiarly sheathed.

Feet not palmate; digits, 4; hallux short and elevated.

There being but a single family and genus recognized in this group, it is difficult, if not impossible, to distinguish those characters which are of family value from those which may prove to be only generic. Indeed, it is rather upon the extraordinary combination here presented, of very diverse characters, than upon the importance attaching to those of any single “system” of the birds’ anatomy that we base the suborder hereby proposed. We regard the Chionomorphs as constituting exactly the heretofore unrecognized link between the Charadriomorphs and Cecomorphs, nearer the latter than the former, and still nearer the common ancestral stock of both.

Mr. A. R. Wallace (Remarks on the value of osteological characters in

the classification of birds) "will not allow that the osteological characters are an all-sufficient guide (in classification), believing that the whole structure of a bird and its corresponding habits may be profoundly modified, while its sternum may closely resemble a common form, and *vice versa*." (See Ibis, 1864, pp. 36-41.) *Chionis* is a forcible illustration of this sound remark.

It seems worth while to note a generic distinction probably existing between *Chionis alba* and the so-called *C. minor*. We have not had the opportunity of examining the former, and must judge solely by the descriptions thereof which have been published. According to De Blainville there is even a difference in the number of the cervical vertebræ. He describes *C. alba* as possessing one more cervical vertebra than we find in *C. minor*. No descriptions allude to the extension of the caruncular casque entirely across the forehead in either species. The various descriptions of *C. alba* indicate a very different arrangement of the caruncular folds about the eye; the sheath of the bill in *C. alba* is flat and closely apposed to the upper mandible, as in *Lestris*, while in *C. minor* it is cauted upward anteriorly and tubular, almost as in the petrels.

These characteristics, among others, seem to us to be supra-specific; and in view of the fact that we consider *Chionis minor* to be undoubtedly nearest to the ancestral type, we propose to call it *Chionarchus*. Its name would then be in strictness *Chionarchus minor* (Hartl.).

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INTRODUCTORY REMARKS.

The present contribution to North American Herpetology is a prodromus of a general work on that subject, undertaken some years ago at the request of the Secretary of the Smithsonian Institution. The material which has been accumulating in the museum of that Institution has offered great advantages for the investigation of the questions of anatomical structure, variations of specific characters, and geographical distribution. It is believed that these subjects are much elucidated by the study of the *Batrachia* and *Reptilia*, since these animals are especially susceptible to physical influences; since, also, they are unable, like birds, and generally not disposed, as are mammals, to make extended migrations, their habitats express nearly the simplest relations of life to its surroundings.

In prosecuting these investigations, it has become necessary to adapt the nomenclature to the results obtained by study of many specimens as to the variation of species. It is a common observation that the better a species of animal is represented in our collections, the wider do we discover its range of variation to be, and the greater the number of supposed distinct species does it become necessary to reduce to the rank of varieties. The definition of a species being simply a number of individuals, certain of whose physical peculiarities belong to them alone, and are at the same time exhibited by all of them, it is evident that, since it is impossible, in the present state of our knowledge, to predicate what those "certain peculiarities" shall be, the only test of specific definition is the constancy of those characters. Hence it is that the most diverse forms of one species may differ more from each other than two recognized species. In the investigation of North American cold-blooded *Vertebrata*, I have observed that many species are represented by well-marked geographical varieties, which, following the example of some ornithologists, I have called *subspecies*. Many of these have been heretofore regarded as species.

In illustration of these remarks, certain species of the genus *Ophibolus* may be selected. The most northern and the most southern forms of the

genus, the *O. triangulum* and *O. coccineus*, have always been regarded as distinct species; and so numerous are their differential characters, in coloration, size, and squamation, that this view would seem to rest on a satisfactory foundation. I find, however, that individuals exist which represent every stage of development of each character which distinguishes them, although certain types appear to be more abundant than the intermediate ones. *O. triangulum* is a species of larger size, with two temporal plates, a row of large dorsal spots, and other smaller ones on the sides, on a grayish ground; with a chevron, and often other marks on the top of the head, and a band posterior to the eye. *O. coccineus* is a small snake with a small loreal plate and one temporal shield; color red, with pairs of black rings extending round the body, and no markings on the head excepting that the anterior ring of the anterior pair crosses the posterior edge of the occipital shields, forming a half collar. The transition is accomplished thus: The lateral borders of the dorsal spots of *O. triangulum* break up, and the lateral spots become attached to their anterior and posterior dark borders. The chevron of the top of the head first breaks into spots, and then its posterior portions unite with each other. The borders of the old dorsal spots continue to the abdomen, where the remaining lateral portions finally meet on the middle line, forming a black line. This breaks up and disappears, leaving the annuli open; and these are then completed in many specimens. The general colors become more brilliant and the size smaller. The head is more depressed; in immediate relation to this form, the loreal plate is reduced in size, and the two temporal shields of *O. triangulum* are reduced to one. Every form of combination of these characters can be found, which represent six species of the books (in North America), viz: *O. triangulum*, *O. doliatus*, *O. annulatus*, *O. gentilis*, *O. amaurus*, and *O. coccineus*. The oldest name is the *O. doliatus*, Linn. Another series of specimens resemble very closely those of the subspecies *coccineus*; in fact, are identical with them in color. The loreal shield is, however, extinguished, and the rows of scales are reduced by one on each side. These specimens simply carry one degree further the modifications already described. Yet, on account of the constancy of these characters, I am compelled to regard these individuals not only as a distinct species, but, on account of the absence of the loreal plate, as belonging to another genus. This is the *Calamaria elapsoidea* of Holbrook; the *Osecola elapsoidea* of Baird and Girard. It affords an illustration of the principle, which I have elsewhere insisted on, "that adjacent species of allied genera may be more alike than remote

species of identical generic characters," which indicates that generic characters originate independently of the specific.*

The classification of the present list is illustrated by the above remarks. I now briefly allude to the rules I have followed in adopting a nomenclature. These rules are those in general use in the United States, as based on the revision of the rules of the British Association for the Advancement of Science by a committee of the American Association, and elaborated in more detail by W. H. Edwards,† after Thorell and Wallace; in other words, the law of priority is followed under the following definitions:

(1) A specific name given by an author must relate to a description or plate of the object intended.

(2) A generic name of a species must be accompanied by a separate definition of the genus intended, by reference to some of its distinctive features.

NOTE.—These two rules are properly regarded as the safeguards of nomenclature, since they offer the only means by which the writings of authors in the sciences concerned can be intelligible. The necessity of these rules will become increasingly apparent, since, as the systematic sciences become more popular, sciolists may publish pages of names in any of their departments, with the effect, should such names be authoritative, of indefinitely postponing the cultivation of the subject. A generic diagnosis is not necessarily perfect in the early stages of the classification of a science, and may be found later to embrace more than one generic type; hence, the following additional rule has been found necessary:

(3) In the subdivision of a genus, names of the new genera are to be adopted in the order of priority of the definition of the divisions to which they refer; the remaining natural generic group retaining the original name, unless the latter has been already given to one of the divisions, as prescribed.

(4) Priority reposes on date of publication, and not on date of reading of papers.

Of course, consistently with the above rules, as divisions of high rank must be defined in order to be understood, names of these unaccompanied by definitions are not binding on the nomenclator.

In regard to orthography, the same code of rules has been followed, viz, in the Latinization of all words of Greek derivation. This has been

*Origin of Genera, Philadelphia, 1868.

†The Canadian Entomologist, 1873, p. 32.

applied especially to the compounding of family-names. Thus, if the generic name is spelled according to Latin rule, the family-name derived from it must be so also; hence, I write *Scaphiopidae*, not Scaphiopodidae; *Rhinoceridae*, not Rhinocerotidae.

In the check-list, the correct name of each species and subspecies is given with reference to a good description. To each is added its geographical range.

PART I.
ARRANGEMENT
OF
THE FAMILIES AND HIGHER DIVISIONS
OF
BATRACHIA AND REPTILIA.

[ADOPTED PROVISIONALLY BY THE SMITHSONIAN INSTITUTION.]

CLASS BATRACHIA.

Order ANURA.

(Anura, Duméril ; Salientia, Merrem, Gray.)

RANIFORMIA.

(Raniformia, Cope, Nat. Hist. Rev., v, 114, 1865.¹)

Ranidae = Ranidae, Cope, N. H. Rev., v, 114–
119, 1865.²

Colostethidae = Colostethidae, Cope, P. A. N. S.
Phila., 1866, 130.³

¹ Raniformia, partim, Dum. et Bib., Erp. Gén.

² Ranidae, Cope, Jour. Acad. Nat. Sci. Phila., n. s., vi, 189, 1867 ; Ranidae, Polypedatidae, and Cystignathidae, pars, Gthr., Cat. Bat. Salien., 1858, 4–26.

³ Colostethidae, Cope, Jour. Acad. Nat. Sci. Phila., n. s., vi, 197, 1867 ; “Calostethidae,” Mivart, Proc. Zool. Soc. London, 1869.

FIRMISTERNIA.⁴

(Bufonoid Raniformia, Cope, Jour. Acad. Nat. Sc. Phila.,
n. s., vi, 190, 1867.)

Dendrobatidae = Dendrobatidae, Cope, N. H. Rev., v,
103-104, 1865.⁵

Phryniscidae = Phryniscidae, Cope, J. A. N. S.
Phila., n. s., vi, 190, 1867.⁶

Engystomidae = Engystomidae, Cope, J. A. N. S.
Phila., n. s., vi, 190, 1867.⁷

Brevicipitidae = Brevicipitidae, Cope, J. A. N. S.
Phila., n. s., vi, 190, 1867.⁸

GASTRECHMIA.

(Gastrechmia, Cope, J. A. N. S. Phila., n. s., vi, 198, 1867.)

Hemisidae = Hemisidae, Cope, J. A. N. S. Phila.,
n. s., vi, 198-199, 1867.⁹

⁴ Firmisternia. Believing the arciferous or raniform sternal structure to have about equal systematic value with the presence or absence of teeth, I have separated the toothless families with raniform sternum under the name of Firmisternia. It is not impossible that this group may turn out to be inseparable from the Gastrechmia. The toothed Aglossa must be distinguished on the same principle from Pipa, and the sub-order is accordingly named Odontaglossa.

⁵ Hylaplesiidae, Gthr., Cat. Bat. Salien., 1858, 124-126.

⁶ Brachycephalina, pars, Gthr., Cat. Bat. Salien., 1858, 42.

⁷ Engystomidae, Cope, N. H. Rev., v, 100-101, 1865; Michrylidae, Brachymeridae, Engystomatidae, Hylaedactylidae, Gthr., Cat. Bat. Salien., 1858.

⁸ Brachymeridae, Cope, pars, N. H. Rev., v, 101-102, 1865.

⁹ Hemisidae; Rhinophrynidae, Cope, pars, N. H. Rev., v, 100, 1865; Rhinophrynidae et Phryniscidae, pars, Mivart, Proc. Zool. Soc. London, 1869, 281-283.

BUFONIFORMIA.

(Bufoniformia, Duméril et Bibron, partim; Cope, partim.)

Rhinophrynidae = Rhinophrynidae, Gthr., Cat. Bat. Sal. B. M., 127, 1858.¹⁰

Bufoidea = Bufoidea, Cope, N. H. Rev., v, 102–103, 1865.¹¹

Batrachophrynidae = Batrachophrynus, Peters, Monatsb. Pr. Akad. Wiss., 1873, 411.

AGLOSSA.

Pipidae = Pipidae, Gthr., Cat. Bat. Sal. B. M., 2–3, 1858.¹²

ODONTAGLOSSA.

Dactylethridae = Dactylethridae, Gthr., Cat. Bat. Sal. B. M., 1–2, 1858.¹³

ARCIFERA.

(Arcifera, Cope, N. H. Rev., v, 104, 1865.¹⁴)

Cystignathidae = Cystignathidae, Cope, N. H. Rev., v, 105, 1865.¹⁵

¹⁰ Rhinophrynidae, Cope, N. H. Rev., v, 100, 1865, pars, nec Mivart; Cope, Jour. Acad. Nat. Sci. Phila., vi, 189, 1867.

¹¹ (Bufoidea) Chelydobatrachus, Gthr., Cat. Bat. Salien., part., 1858, 51, 53–54.

¹² Pipidae, Cope, N. H. Rev., v, 98–99, 1865; Pipidae, Mivart, Proc. Zool. Soc. London, 1869, 287, 295.

¹³ Dactylethridae, Cope, N. H. Rev., v, 99, 1865; Dactylethridae, Mivart, Proc. Zool. Soc. London, 1869, 295.

¹⁴ Arcifera, Cope, Jour. Nat. Sci. Phila., vi, 67–68, 1866.

¹⁵ Cystignathidae, Ranidae partim, Cystignathidae, Uperoliidae, Bombinatoridae partim, Alytidae partim, Hylodidae, Gthr.; Ranidae partim, Polypedatidae partim, Discoglossidae partim, Mivart, Proc. Zool. Soc. London, 1869.

- Hemiphractidae = Hemiphractidae, Cope, J. A. N. S. Phila., n. s., vi, 69, 1866.
- Hylidae > Hylidae, Gthr., Cat. Bat. Salien., 96, 1858.¹⁶
- Scaphiopidae = Scaphiopodidae, Cope, J. A. N. S. Phila., n. s., vi, 69, 1866.¹⁷
- Pelodytidae = Pelodytidae, Cope, J. A. N. S. Phila., vi, 69, 1866.¹⁸
- Asterophrydidae = Asterophrydidae, Cope, J. A. N. S. Phila., n. s., vi, 79-80.^{16a}
- Discoglossidae = Discoglossidae, Cope, N. H. Rev., v, 105-107, 1865.¹⁹

Order STEGOCEPHALI.

(Stegocephali, Cope, P. A. N. S. Phila., 1868, 209.²⁰)

LABYRINTHODONTIA.

- Baphetidae* = *Baphetidae*, Cope, MSS.
- Anthracosauridae* = *Anthracosauridae*, Cope, MSS.

GANOCEPHALA.

- Colosteidae* = *Colosteidae*, Cope, MSS.²¹

¹⁶ Hylidae, Cope, T. A. N. S. Phila., vi, 83-85, 1866.

¹⁷ Scaphiopodidae partim, N. H. Rev., v, 107-108, 1865.

¹⁸ Pelodytidae. Scaphiopodidae pars, Cope, olim, Jour. Acad. Nat. Sci. Phila., vi, 69, 1866.

¹⁹ Discoglossidae, Cope, Jour. Acad. Nat. Sci. Phila., vi, 69, 1866; Discoglossidae partim, 34, Bombinatoridae partim et Alytidae partim Gthr., Cat. Bat. Salien., 40, 57, 1858; Mivart, Proc. Zool. Soc. London, 1869, 294-295

²⁰ Stegocephali, Cope, Trans. Am. Phil. Soc. 1870, 6-7.

²¹ Colosteus, Cope.

MICROSAURIA.

- Phlegethontiidae* = *Phlegethontiidae*, Cope, MSS.^{21a}
Molgophidae = *Molgophidae*, Cope, MSS.²²
Ptyoniidae = *Ptyoniidae*, Cope, MSS.²³
Tuditanidae = *Tuditanidae*, Cope, MSS.
Peliontidae = *Peliontidae*, Cope, MSS.²⁴

Order GYMNOPIIDIA.

(Gymnophiona, Müller.)

- Cacciliidae* = *Cacciliidae*, Gray, Cat. Bat. Grad. B.
M., 57, 1850.

Order URODELA.

- Pleurodelidae* = { *Seiranotidae*, } Gray, P. Z. S.
{ *Pleurodelidae*, } London, xxvi,
137-143, 1858.
*Salamandridae*²⁵ = *Salamandridae*, Gray, P. Z. S. Lon-
don, xxvi, 142-143, 1858.
*Hynobiidae*²⁶ = *Hynobiidae*, Cope, J. A. N. S. Phila.,
. n. s., vi, 107, 1866.
Desmognathidae = *Desmognathidae*, Cope, J. A. N. S.
Phila., n. s., vi, 107, 1866.
Thoriidae = *Thoriidae*, Cope, P. A. N. S. Phila.,
1869, 111-112.

^{21a} *Phlegethontia*, Cope.²² *Molgophis*, Cope.²³ *Lepterpeton*, Huxl.; *Oestocephalus*, Cope; *Urocordylus*, Huxl.²⁴ *Pelion*, Wyman.²⁵ *Salamandridae*, Cope, Jour. Acad. Nat. Sci. Phila., vi, 107-108, 1866.²⁶ *Hynobiidae*, Cope; *Molgidae*, Gray, 1850.

- Plethodontidae²⁷ = Plethodontidae, Cope, J. A. N. S. Phila., n. s., vi, 106–107, 1866.
- Amblystomidae²⁸ = Amblystomidae, Cope, J. A. N. S. Phila., n. s., vi, 105–106, 1866.
- Menopomidae = Protonopsidae, Gray, Cat. Bat. Grad. B. M., 52–54, 1850.
- Amphiumidae = Amphiumidae, Cope, J. A. N. S. Phila., n. s., vi, 104–105, 1866.
- Cocytinidae* = *Cocytinidae*, Cope, MSS.²⁹

Order PROTEIDA.

- Proteidae = Proteidae, Gray, Cat. Bat. Grad. B. M., 64–67, 1850.

Order TRACHYSTOMATA.

- Sirenidae = Sirenidae, Gray, Cat. Bat. Grad. B. M., 67–69, 1850.

CLASS REPTILIA.

Order ORNITHOSAURIA.

(Ornithosauria, Bonaparte, Fitzinger, Seeley.³⁰)

- Dimorphodontidae* = Dimorphodontidae, Cope, P. A. A. A. S. 1870, 234, 1871.³¹

²⁷ Plethodontidae, Cope, Jour. Acad. Nat. Sci. Phila., vi, 106, 1866, partim Gray, 1850.

²⁸ Amblystomidae. Plethodontidae partim, Gray, 1850.

²⁹ Coecytinus, Cope, Trans. Am. Philos. Soc. Phila., 1874.

³⁰ Ornithosauria = Pterosauria, Owen.

³¹ Dimorphodontae, Seeley.

Pterodactylidae = *Pterodactylidae*, Cope, P. A. A. A.
S., xix, 234, 1871.³²

Order DINOSAURIA.

(Dinosauria, Owen, Cope, Seeley; *Pachypodes*, Meyer;
Ornithoscelida, Huxley.)

SYMPHYPODA.

(Symphypoda, Cope; Compsognatha, Huxley.)

Compsognathidae = *Compsognathidae*, Cope, P. A. A. A.
S., xix, 234, 1871³³ (name only).

Ornithotarsidae = *Ornithotarsidae*, Cope, P. A. A. A.
S., 234, 1871³⁴ (name only).

GONIOPODA.

(Goniopoda, Cope; Harpagmosauria, Haeckel.)

Megalosauridae = *Megalosauridae*, Cope, P. A. A. A.
S., xix, 234, 1871 (name only).³⁵

Teratosauridae = *Teratosauridae*, Cope, P. A. A. A.
S., xix, 234, 1871 (name only).³⁶

ORTHOPODA.

(Orthopoda, Cope; Therosauria, Haeckel.)

Scelidosauridae = *Scelidosauridae*, Cope, T. A. P. S.,
n. s., xiv, 91, 1869.³⁷

³² Rhamporhynchae et Pterodactylae, Seeley, loc. cit.

³³ Compsognathidae = Compsognathus, Wag.

³⁴ Ornithotarsidae = Ornithotarsus, Cope.

³⁵ Megalosauridae, Huxley.

³⁶ Teratosaurus, Plateosaurus, Meyer, etc.

³⁷ Scelidosauridae, Huxley, Journ. Geol. Soc. London, 1870.

Iguanodontidae = *Iguanodontidae*, Cope, T. A. P. S.,
n. s., xiv, 91, 1869.³⁸

Hadrosauridae = *Hadrosauridae*, Cope, T. A. P. S.,
n. s., xiv, 91-98, 1869.³⁹

Order CROCODILIA.

(Crocodilia et Thecodontia, partim, Owen, 1841.)

PARASUCHIA.

Belodontidae = *Belodontidae*, Cope, P. A. A. A. S.,
xix, 234, 1871 (name only).⁴⁰

AMPHICOELIA.

Teleosauridae = *Teleosauridae*, Cope, P. A. A. A. S.,
xix, 234, 1871 (name only).

Goniopholididae = *Goniopholis*, Owen, etc.

PROCOELIA.

Thoracosauridae = *Thoracosauridae*, Cope, P. A. A. A. S.,
xix, 235, 1871 (name only).⁴¹

Crocodylidae = *Crocodylidae*, Cope, P. A. A. A. S.,
xix, 235, 1871 (name only).⁴²

Order SAUROPTERYGIA.

(Sauropterygia, Owen.)

? *Placodontidae* = *Placodontidae*, Cope, P. A. A. A. S.,
xix, 235, 1871 (name only).⁴³

³⁸ *Iguanodontidae*, Huxley, Journ. Geol. Soc. London, 1870.

³⁹ *Hadrosauridae*, Huxley, Journ. Geol. Soc. London, 1870.

⁴⁰ *Thecodontia*, Owen, pt.; Cope, Tr. A. P. S., 1869, 32.

⁴¹ *Thoracosaurus*, Leidy, Cope.

⁴² *Crocodylidae* + *Alligatoridae*, Gray, + *Gavialidae*, Gray, + *Holops* and *Thecachamps*, Cope, etc., Pr. A. A. A. S., xix, 235, 1871.

⁴³ *Placodus*, Agass.

Plesiosauridae = *Plesiosauridae*, Cope, P. A. A. A.
S., xix, 235, 1871 (name only).⁴⁴

Elasmosauridae = *Elasmosauridae*, Cope, Tr. A. P. S.,
n. s., xiv, 1869, p. 47.⁴⁵

Order ANOMODONTIA.

(Anomodontia, Owen.)

Dicynodontidae = *Dicynodontidae*, Cope, P. A. A. A.
S., xix, 235, 1871 (name only).⁴⁶

Oudenodontidae = *Oudenodontidae*, Cope, P. A. A. A.
S., xix, 235, 1871 (name only).⁴⁷

Order ICHTHYOPTERYGIA.

Ichthyosauridae = *Ichthyosauridae*, Cope, P. A. A. A.
S., xix, 235, 1871.

Order RHYNCHOCEPHALIA.

Protorosauridae = *Protorosauridae*, Cope, P. A. A. A.
S., xix, 235, 1871 (name only).⁴⁸

Sphenodontidae = *Sphenodontidae*, Cope, P. A. A. A.
S., xix, 235, 1871.⁴⁹

Rhynchosauridae = *Rhynchosauridae*, Cope, P. A. A. A.
S., xix, 235, 1870 (name only).⁵⁰

⁴⁴ Nothosaurus, Pistosaurus, Plesiosaurus, Pliosaurus, etc.

⁴⁵ Elasmosaurus, Cimoliasaurus, etc.

⁴⁶ Dicynodontidae, Owen, Paleontology.

⁴⁷ Cyptodontia, Owen, Paleontology.

⁴⁸ Protorosaurus, Meyer (elongate sacrum).

⁴⁹ Hatteriidæ, Cope, Proc. Acad. Nat. Sc. Phila., 1864, 225-7.

⁵⁰ Rhynchosaurus, Owen.

Order TESTUDINATA.

ATHECAE.

(Athecae, Cope, P. A. A. A. S., xix, p. 235, 1870.)

- Sphargididae = Sphargididae, Gray, Ann. Philos.,
1825.⁵¹
- Protostegidae = Protostega, Cope, Proc. A. P. S.,
1872, 413.

CRYPTODIRA.

- Cheloniidae = Cheloniidae, Gray, Annals Philoso-
phy, 1825.⁵²
- Propleuridae* = *Propleuridae*, Cope, Am. Jour. Sc.
and Arts, l. 137, 1870.
- Trionychidae = Trionychidae, Gray, Annals of Phi-
losophy, 1825.⁵³
- Emydidae = Emydidae, Agassiz, Cont. Nat. Hist.
U. S., i, p. 351.⁵⁴
- Chelydridae = Chelydridae, Agassiz, Contrib. N. H.
U. S., i, 341.^{54a}
- Cinosternidae = Cinosternidae, Agassiz, Cont. Nat.
Hist. U. S., i, 347.
- Testudinidae = Testudinidae, Cope, P. A. N. S.
Phil., 1868, p. 282.⁵⁵

⁵¹ Sphargididae, Bell, Fitzinger, Agassiz.⁵² Cheloniidae, Gray, Ann. Phil., 1825; Agass., Cope, P. A. A. A. S., xix, 235, 1871.⁵³ Trionychidae, Bell, Wiegmann, Dum. et Bibr., Agass.⁵⁴ Emydidae—Chelydridae, Cope, P. A. A. A. S., xix, 235, 1871 (name only).^{54a} Chelydra, Cope, P. A. N. S. Phila., 1872.⁵⁵ Testudinidae, Gray, Agass.

- Pleurosternidae* = *Pleurosternidae*, Cope, P. A. N. S.
Phila., 1868, 282 (name only).
Adocidae = *Adocidae*, Cope, P. A. P. S.,
1870, 547.

PLEURODIRA.

(Pleurodira, Dum. et Bibron; Chelyoidae, Agass.)

- Podocnemididae* = *Podocnemididae*, Cope, P. A. N. S.
Phila., 1868, 282.
Chelydidae = *Chelydidae*, Gray, P. Z. S. London,
1869, pp. 208-209.
Hydraspididae = *Hydraspididae*, Cope, P. A. N. S.
Phila., 1868, 282.
Pelomedusidae = *Pelomedusidae*, Cope, P. A. N. S.
Phila., 1865, 185; 1868, p. 119.
Sternothaeridae = *Sternothaeridae*, Cope, P. A. N. S.
Phila., 1868, 119.

Order LACERTILIA.

(Lacertilia, Owen; Cope, P. A. A. S., xix, 236, 1870.)

RHIPTOGLOSSA.

(Acrodonta Rhipioglossa, Wiegmann, Fitzinger, Cope;
Chamaeleonida, Müller.)

- Chamaeleontidae* = *Chamaeleontidae*, Gray, Cat. Lizards
B. M., 1845, 264 (name only).⁵⁶

⁵⁶ Wiegmann, Gray, etc.

PACHYGLOSSA.

(Pachyglossa, Cope ; Acrodonta Pachyglossa, Wagler, Fitzinger, Cope, P. A. N. S. Phila., 1864, 226-227.)

Agamidae = Agamidae, Gray, Cat. B. M., 1845, 230.

NYCTISAURA.

(Nytisaura, Gray, Cat. Lizards B. M. ; Cope, P. A. N. S. Phila., 1864, 225.)

Gecconidae = Gecconidae, Gray, Cat. Lizards B. M., 1845, 142.⁵⁷

PLEURODONTA.

(Pleurodonta, Cope, P. A. N. S. Phila., 1864, 226.)

a. *Iguania*.

Anolidae = Anolidae, Cope, P. A. N. S. Phila., 1864, 227, 228.

Iguanidae = Iguanidae, Cope, P. A. N. S. Phila., 1864, 227, 228.⁵⁸

b. *Diploglossa*.

Anguidae = Anguidae, Cope, P. A. N. S. Phila., 1864, 228.

Gerrhonotidae = Gerrhonotidae, Cope, P. A. N. S. Phila., 1864, 228.⁵⁹

⁵⁷ Cope, Pr. A. A. A. S., xix, 236, 1871.

⁵⁸ Iguanidae pars auctorum.

⁵⁹ Zonuridae, pt., Gray.

Xenosauridae = Xenosauridae, Cope, P. A. N. S. Phila., 1866, 322.

Helodermidae = Helodermidae, Gray, Cat. Lizards B. M., 1845.⁶⁰

c. *Thecaglossa*.

(Thecaglossa, Wagler, Fitzinger, Cope.)

Varanidae = Varanidae, Cope, P. A. A. S., xix, 237, 1870.

d. *Leptoglossa*.

(Leptoglossa, Wiegmann, Fitzinger, Cope.)

Teidae = Teidae, Cope, P. A. A. S., xix, 237, 1871.⁶¹

Lacertidae = Lacertinidae, Gray, Cat. Lizards B. M., 26-44, 1845.⁶²

Zonuridae = Zonuridae, Cope, P. A. A. S., xix, 237-241, 1871.⁶³

Chalcidae = Chalcidae, Gray, Cat. Lizards B. M., 57-58, 1845.⁶⁴

Scincidae = Scincidae, Gray, Cat. Lizards B. M., 70-120, 1845.⁶⁵

Sepsidae = Sepsidae, Gray, Cat. Lizards B. M., 121-126, 1845.⁶⁶

⁶⁰ Helodermidae, Cope, Proc. Acad. Nat. Sci. Phila., 1864, 228; 1866, 322.

⁶¹ Teidae and Eepleopodidae, Peters, Cope (Proc. Acad. Nat. Sci. Phila., 1864, 229); Teidae, Anadiidae, Cercosauridae, Riamidae, Gray.

⁶² Lacertidae, Cope, Proc. Acad. Nat. Sci. Phila., 1864, 228; Lacertidae et Cricosauridae, Peters; Xantusiidae, Baird.

⁶³ Zonuridae, pt., Gray; Lacertidae pt., Cope.

⁶⁴ Chalcididae, Cope, Proc. Acad. Nat. Sci. Phila., 1864, 228.

⁶⁵ Scincidae, Cope, Proc. Acad. Nat. Sci. Phila., 1864, 228.

⁶⁶ Sepsidae, Cope, Proc. Acad. Nat. Sci. Phila., 1864, 228.

c. *Typhlophthalmi*.(Typhlophthalmi, Cope, P. A. N. S. Phila., 1864, 228.⁶⁷)Feyliniidae = Anelytropidae, Cope, P. A. N. S. Phila., 1864, 230.⁶⁸Acontiidae = Acontiadae, Gray, Cat. Lizards B. M., 126–127, 1845.⁶⁹

Aniellidae = Aniellidae, Cope, P. A. N. S. Phila., 1864, 230.

OPHEOSAURI.

(Opheosauri, Cope, P. A. N. S. Phila., 1864, 226.⁷⁰)Amphisbaenidae = Amphisbaenidae, Gray, Cat. Tort. Croc., etc. B. M., 69, 1844.⁷¹Trogonophidae = Trigonophidae, Gray, Catal. Tort. Croc., etc. B. M., 68, 1844.⁷²

Order PYTHONOMORPHA.

(Pythonomorpha, Cope, T. A. P. S., n. s., xiv, 175–182, 1870.⁷³)*Mosasauridae* > *Mosasauridae*, Cope, T. A. P. S., n. s., xiv, 182–211, 1870.⁶⁷ Typhlophthalmi, pars., Dum. et Bib., Erp. Gen.⁶⁸ Typhlinidae, Gray.⁶⁹ Acontiidae, Cope, Proc. Acad. Nat. Sci. Phila., 1864, 230.⁷⁰ Ophisauri, Merrem; Annulati, Wiegmann; Ptychopleures Glyptodermes, Dum. et Bib.; Amphisbaenoidea, Müller.⁷¹ Amphisbaenidae, Wiegmann.⁷² Trogonophes, Wiegmann, Fitzinger.⁷³ Pythonomorpha, Cope, Proc. Bost. Nat. Hist. Soc., 1869, 251; Lacertilia Natantia, Owen, Paleontographical Soc. Cretaceous Reptiles.

Order OPHIDIA.

SCOLECOPHIDIA.

(Scolecophidia, Dum. et Bib.⁷⁴)

- Typhlopidae = Typhlopidae, Cope, P. A. A. A. S.,
xix, 237, 1871 (name only).⁷⁵
- Stenostomidae = Stenostomidae, Cope, P. A. A. A. S.,
xix, 237, 1871 (name only).⁷⁶

TORTRICINA.

(Tortricina, Müller.⁷⁷)

- Tortricidae = Tortricidae, Cope, P. A. N. S. Phila.,
1864, 230.
- Uropeltidae = Uropeltidae, Cope, P. A. N. S. Phila.,
1864, 230.⁷⁸

ASINEA.

(Asinea, Müller, Cope.)

a. *Peropoda*.

(Peropoda, Müller.)

- Xenopeltidae = Xenopeltidae, Cope, P. A. N. S.
Phila., 1864, 230.⁷⁹
- Pythonidae = Pythonidae, Cope, P. A. N. S. Phila.,
1864, 230.⁸⁰

⁷⁴ Scolecophidia et Catodonta, Cope, Proc. Acad. Nat. Sci. Phila., 1864, 230.⁷⁵ Epanodontiens, Dum. et Bib.⁷⁶ Catodontiens, Dum. et Bib.; Catodonta, Cope, olim.⁷⁷ Tortricina, Cope, Proc. Acad. Nat. Sci. Phila., 1864, 230.⁷⁸ Uropeltacea, Peters; Rhinophidae, Gray.⁷⁹ Xenopeltidae, Gthr., Reptiles British India.⁸⁰ Holodontiens, Dum. et Bib.

- Boidae = Boidae, Cope, P. A. N. S. Phila.,
1864, 230.⁸¹
- Lichanuridae = Lichanuridae, Cope, P. A. N. S.
Phila., 1868, 2.

b. *Colubroidea*.

- Achrochordidae = Achrochordidae, Cope, P. A. N. S.
Phila., 1864, 231.⁸²
- Homalopsidae = Homalopsinae, Cope, P. A. N. S.
Phila., 1864, 167.⁸³
- Colubridae = Colubridae, Cope, P. A. A. A. S.,
xix, 238, 1870.⁸⁴
- Rhabdosomidae = Rhabdosomidae, Cope, P. A. A. A.
S., xix, 238, 1870.⁸⁵

PROTEROGLYPHA.

a. *Conocerca*.

- Elapidae = Elapidae, Cope, P. A. N. S. Phila.,
1864, 231.⁸⁶
- Najidae = Najidae, Cope, P. A. N. S. Phila.,
1864, 231.⁸⁷

⁸¹ Apterodontiens, Dum. et Bib.

⁸² Achrochordiens, Dum. et Bib.

⁸³ Natricidae, pars, Gthr., Cat. Col. Snakes B. M., 1858, 50-84, Potamophilidae, Jan.

⁸⁴ Asinea, Group β -bb, Cope, Proc. Acad. Nat. Sci. Phila., 1864, 231; Calamaridae, Olgodontidae, Coronellidae, Colubridae, Dryadidae, Dendrophididae, Dryiophididae, Psammophididae, Lycodontidae, Scytalidae, Dipsadidae, etc., Gthr., Cat. Col. Snakes B. M., 1858, et op. alt.

⁸⁵ Calamaridae partim, Gthr., Cat. Col. Snakes B. M., 1858, 2-22.

⁸⁶ Elapidae (pars), Gthr., Cat. Col. Snakes B. M., 1858, 209-237.

⁸⁷ Elapidae (pars altera), Gthr., Cat. Col. Snakes B. M., 1858, 209-237.

b. *Platyserca*.

Hydrophidae = Hydridae, Gray, Cat. Snakes B. M.,
2, 35, 40, 1849.⁸⁸

SOLENOGLYPHA.⁸⁹

(Solenoglypha, Dum. et Bib.)

Atractaspididae = Atractaspididae, Gthr., Cat. Snakes
B. M., 239, 1858.⁹⁰

Causidae = Causidae, Cope, P. A. N. S., Phila.,
1859, 334.

Viperidae = Viperidae, Gray, Cat. Brit. Mus.,
p. 18.⁹¹

Crotalidae = Crotalidae, Gray, Cat. Brit. Mus.⁹²

⁸⁸ Hydridae, Gray; Hydrophidae, Schmidt, Fischer; Cope, Proc. Acad. Phila., 1859, 333.

⁸⁹ Viperidae, Cope, Proc. Acad. Nat. Sci. Phila., 1859, 333.

⁹⁰ Atractaspidinae, Cope, Proc. Acad. Nat. Sci. Phila., 1859, 334.

⁹¹ Viperinae, Cope, Proc. Acad. Nat. Sci. Phila., 1859; Günther.

⁹² Crotalinae, Cope, Proc. Acad. Nat. Sci. Phila., 1859; Günther, Cat. Col. Snakes B. M. et auctorum.

PART II.
CHECK-LIST
OF
THE SPECIES OF BATRACHIA AND REPTILIA
OF
THE NEARCTIC OR NORTH AMERICAN REALM.

BATRACHIA.
TRACHYSTOMATA.

SIRENIDAE.

SIREX, Linn.

Siren lacertina, Linn.; Holbrook, N. Am. Herpetology, vol. v, p. 101.
The Austroriparian region; extreme points North Carolina, Florida,
Matamoras, Mexico, and Alton, Illinois.

PSEUDOBRANCHUS, Gray.

Pseudobranchius striatus, LeConte; Holbrook, American Herpetology,
vol. v, p. 109. Georgia.

PROTEIDA.

PROTEIDAE.

NECTURUS, Raf.

Necturus lateralis, Say; Holbrook, Am. Herp., vol. v, pp. 111, 115.
Eastern region except New England and eastern Middle States;
from a few points in the Austroriparian.

Necturus punctatus, Gibbes. Eastern South Carolina.

CADUCIBRANCHIATA.

AMPHIUMIDAE.

AMPHIUMA, Linn.

Amphiura means, Linn.; Holbrook, Am. Herp., v, p. 89. Austroriparian region, from North Carolina to Mississippi.

MURAENOPSIS, Fitzinger.

Muraenopsis tridactylus, Cuvier; Holbrook, Am. Herp., v, p. 93. Mississippi and Louisiana.

MENOPOMIDAE.

MENOPOMA, Harl.

Menopoma allegheniense, Harl.; Holbrook, Am. Herp., v, p. 95. All tributaries of the Mississippi, and streams of the Louisianian district to North Carolina.

Menopoma fuscum, Holbrook, Am. Herp., v, p. 99. Headwaters of the Tennessee River.

AMBLYSTOMIDAE.

AMBLYSTOMA, Tschudi.

Amblystoma talpoideum, Holbrook; Cope, Proceedings Academy Philadelphia, 1867, p. 172. Austroriparian region; mountains of South Carolina.

Amblystoma opacum, Gravenhorst; Cope, Proceed. Acad. Phila., 1867, p. 173. From Pennsylvania to Florida, to Wisconsin, and to Texas.

Amblystoma punctatum, Linn.; Cope, loc. cit., 1867, p. 175. United States, east of the plains; Nova Scotia.

Amblystoma conspersum, Cope, loc. cit., 1867, 177. Pennsylvania to Georgia.

Amblystoma bicolor, Hallowell; Cope, loc. cit., 178. New Jersey.

Amblystoma tigrinum, Green; Cope, loc. cit., 179. United States, east of the plains.

Amblystoma macortium, Baird; Cope, loc. cit., 184. United States, in the Central, Sonoran, and Pacific regions.

Amblystoma macortium, Baird; subspecies *californiense*, Gray; Cope, loc. cit., p. 187. Pacific region.

- Amblystoma obscurum*, Baird ; Cope, loc. cit., p. 192. Iowa.
- Amblystoma xiphias*, Cope, loc. cit., p. 192. Ohio.
- Amblystoma trisruptum*, Cope, loc. cit., p. 194. New Mexico.
- Amblystoma jeffersonianum*, Green, subspecies *jeffersonianum*, Green ; Cope, loc. cit., p. 195. Pennsylvania and Ohio, and northward.
- Amblystoma jeffersonianum*, Green, subspecies *laterale*, Hallowell ; Cope, loc. cit., p. 197. Canada and Wisconsin, and northward.
- Amblystoma jeffersonianum*, Green, subspecies *fuscum*, Hallowell ; Cope, loc. cit., 197. Indiana and Virginia.
- Amblystoma jeffersonianum*, Green, subspecies *platinum* ; Cope, loc. cit., p. 198. Ohio.
- Amblystoma macrodactylum*, Baird ; Cope, loc. cit., p. 198. Pacific region.
- Amblystoma paroticum*, Baird ; Cope, loc. cit., p. 200. Vancouver's Island and Washington Territory.
- Amblystoma aterrimum*, Cope, loc. cit., p. 201. Northern Rocky Mountains.
- Amblystoma tenebrosum*, Baird and Girard ; Cope, loc. cit., p. 202. Pacific region of Oregon and California.
- Amblystoma texanum*, Matthes ; Cope, loc. cit., p. 204. Texas.
- Amblystoma cingulatum*, Cope, loc. cit., p. 205. South Carolina.
- Amblystoma microstomum*, Cope, loc. cit., p. 206. Austroriparian and Eastern regions, west of the Alleghany Mountains.

DICAMPTODON, Strauch.

- Dicamptodon ensatus*, Eschscholz, Zoölogical Atlas, part v, p. 6, pl. xxii. Pacific region.

PLETHODONTIDAE.

BATRACHOSEPS, Bonap.

- Batrachoseps attenuatus*, Eschscholz, Hallowell, Jour. Acad. Phila., 1858, p. 348. Pacific region.
- Batrachoseps nigriventris*, Cope, Proceed. Acad. Phila., 1869, p. 98. Fort Tejon, California.
- Batrachoseps pacificus*, Cope, Proceed. Acad. 1865, p. 195. Santa Barbara, Cal.

HEMIDACTYLIUM, Tschudi.

- Hemidactylium scutatum*, Schlegel ; Duméril et Bibron, Erp. Générale, ix, p. 118-9. Rhode Island to Illinois, and to the Gulf of Mexico.

PLETHODON, Tschudi.

- Plethodon cinereus*, Green, subspecies *cinereus*, Green; Cope, Proceed. Acad. Phila., 1869, p. 99. Eastern region.
- Plethodon cinereus*, Green, subspecies *erythronotus*, Green; Holbrook, N. Am. Herp., v, p. 43. Eastern region.
- Plethodon cinereus*, Green, subspecies *dorsalis*, Baird, MSS. Louisville, Ky.; Salem, Mass.
- Plethodon intermedius*, Baird, Proceed. Acad. Phila., 1857, p. 209. Vancouver's Island.
- Plethodon glutinosus*, Green; Cope, loc. cit., 1869, p. 99. Eastern and Austroriparian regions.
- Plethodon oregonensis*, Girard; Cope, loc. cit., p. 99. Pacific region.
- Plethodon flavipunctatus*, Stranch., Mem. Acad. Sci. St. Petersburg, 1871, xvi, 71. ? New Albion, Cal.
- Plethodon croceator*, Cope, loc. cit., 1857, p. 210. Lower California.

STEREOCHILUS, Cope.

- Stereochilus marginatum*, Hallowell; Cope, loc. cit., 1869, 101. Georgia.

MANCULUS, Cope.

- Manculus remifer*. Cope, Report of Peabody Academy, Salem, Mass., 1869, p. 84. Florida.
- Manculus quadridigitatus*, Holbrook, N. Am. Herp., v, p. 65. North Carolina to Florida.

SPELERPES, Raf.

- Spelerpes multiplicatus*, Cope, Proceed. Acad. Phila., 1869, p. 106. Arkansas.
- Spelerpes bilineatus*, Green; Cope, loc. cit., p. 105. Eastern and Austroriparian regions, excepting Texas.
- Spelerpes longicaudus*, Green; Cope, loc. cit., p. 105. Eastern and Austroriparian regions, except Texas.
- Spelerpes guttolineatus*, Holbrook; Cope, loc. cit., p. 105. North and South Carolina, Georgia, and Alabama.
- Spelerpes ruber*, Daudin, subspecies *ruber*, Daudin; Cope, loc. cit., 1869, 105. Eastern and Austroriparian regions.

Spelerpes ruber, subspecies *stieticeps*, Baird, MSS. South Carolina.

Spelerpes ruber, Daudin, subspecies *montanus*, Baird; Jour. Acad. Phila., vol. i, p. 293. Alleghany Mountains, from Pennsylvania to South Carolina.

GYRINOPHILUS, Cope.

Gyrinophilus porphyriticus, Green; Cope, Proceed. Acad. Phila., 1869, p. 108. Alleghany Mountains, from New York to Alabama.

ANAIDES, Baird.

Anaides lugubris, Hallowell; Cope, loc. cit., 1869, p. 109. Entire Pacific region.

Anaides ferreus, Cope, loc. cit., 1869, p. 109. Oregon.

DESMOGNATHIDAE.

DESMOGNATHUS, Baird.

Desmognathus ochrophaca, Cope, Proceed. Acad. Phila., 1869, p. 113. Alleghany Mountains, from New York to Georgia.

Desmognathus fusca, Rafinesque; Cope, loc. cit., 115; subspecies *fusca*, Raf.; Cope, loc. cit., 116. Essex County, Massachusetts, to Biloxi, Mississippi.

Desmognathus fusca, Raf., subspecies *auriculata*, Holbrook; Cope, loc. cit., p. 116. South Carolina to Louisiana.

Desmognathus nigra, Green; Cope, loc. cit., p. 117. Alleghany Mountains, from Pennsylvania southward.

PLEURODELIDAE.

DIEMYCTYLUS, Rafinesque.

Diemyctylus torosus, Eschscholz; Girard, U. S. Expl. Exped., 1858, p. 5. Pacific region.

Diemyctylus miniatus, Raf., subspecies *miniatus*, Raf.; Hallowell, loc. cit.; Holbrook, N. Am. Herp., v, p. 57. Eastern and Austroriparian regions.

Diemyctylus miniatus, Raf., subspecies *viridescens*, Raf.; Holbrook, N. Am. Herp., v, p. 77. Eastern and Austroriparian regions.

ANURA.

BUFONIFORMIA.

BUFONIDAE.

BUFO, Laurenti.

Bufo punctatus, Baird; Girard, U. S. Mex. Bound. Surv., ii, p. 25.
Sonoran and Lower Californian regions.

Bufo debilis, Girard; Baird, U. S. Mex. Bound. Surv., ii, p. 26 (*B. insidiosus*).
Sonoran region.

• *Bufo halophilus*, Baird; Girard, U. S. Mex. Bound. Surv., ii, p. 26. Pacific
region.

Bufo columbiensis, Baird; Girard, Herpetology U. S. Expl. Exped., 77.
Pacific region and Montana.

Bufo alvarius, Girard, U. S. Mex. Bound. Surv., ii, p. 26. Sonoran
region.

Bufo microscaphus, Cope, Proc. Acad. Nat. Sci. Phila., 1866, p. 301.
Sonoran region.

Bufo speciosus, Girard, U. S. Mex. Bound. Surv., ii, p. 26. Lower Rio
Grande (Sonoran).

Bufo lentiginosus, Shaw, subspecies *frontosus*, Cope, Proc. Acad. Phila.,
1866, p. 301. Sonoran region.

Bufo lentiginosus, subspecies *cognatus*, Say; Holbrook, N. Am. Herp., v,
p. 21. Texan district.

Bufo lentiginosus, subspecies *americanus*, LeCôte; Holbrook, Girard,
U. S. Mex. Bound. Surv., ii, p. 25. Eastern and Austroriparian
regions to the plains.

Bufo lentiginosus, subspecies *lentiginosus*, Latr.; Holbrook, N. Am. Herp.,
v, p. 7. Austroriparian region.

Bufo lentiginosus, subspecies *fowlerii*, Putnam, MSS. Massachusetts to
Lake Winnipeg.

Bufo quercicus, Holbrook, N. Am. Herp., v, p. 13; Cope, Proc. Acad.
Phila., 1862, p. 341. Floridan and Eastern Louisiana districts to
North Carolina.

Bufo valliceps, Wiegmann; Girard, U. S. Mex. Bound. Surv., ii, p. 25,
pl. xl, figs. 1-4 (*B. nebulifer*, Girard). Texan district (also Mexico).

FIRMISTERIA.

ENGYSTOMIDAE.

ENGYSTOMA, Fitzinger.

Engystoma carolinaense, Holbrook, N. Am. Herp., v, p. 23. Austroriparian region.

ARCIFERA.

HYLIDAE.

ACRIS, Dum., Bibr.

Acris gryllus, LeConte, subspecies *gryllus*, Holbrook, N. Am. Herp., iv, p. 131. Austroriparian region.

Acris gryllus, LeConte, subspecies *crepitans*, Baird, U. S. Mex. Bound. Surv., ii, p. 28. Eastern and Central regions.

CHOROPHILUS, Baird.

Chorophilus triseriatus, Wied, subspecies *clarkii*, Baird, U. S. Mex. Bound. Surv., p. 28. Texan district.

Chorophilus triseriatus, subspecies *triseriatus*, Wied. Central and Eastern regions.

Chorophilus triseriatus, subspecies *corporalis*, Cope, MSS. New Jersey.

Chorophilus nigratus, LeConte; Holbrook, N. Am. Herp., iv, p. 107. South Carolina and Georgia.

Chorophilus angulatus, Cope (*Cystignathus ocularis*), Holbrook, N. Am. Herp., iv, p. 137. South Carolina.

Chorophilus ocularis, Daudin (*Cystignathus ornatus*), Günther, Cat. Bat. Salien. Brit. Mus., p. 29. South Carolina and Georgia.

Chorophilus ornatus, Holbrook, N. Am. Herp., iv, p. 25. South Carolina; Georgia.

HYLA, Laurenti.

Hyla curta, Cope, Proc. Acad. Phila., 1866, p. 313. Lower Californian region.

Hyla regilla, Baird; Girard, U. S. Expl. Exped., p. 60. Pacific region.

Hyla eximia, Baird, U. S. Mex. Bound. Surv., p. 29. Sonoran region.

Hyla andersonii, Baird; Cope, Proc. Phila. Acad., 1862, 154. New Jersey to South Carolina.

Hyla squirella, Daudin; Holbrook, N. Am. Herp., iv, pl. 30. Austroriparian region.

Hyla carolinensis, Pennant; Holbrook, N. Am. Herp., iv, p. 29. Austroriparian region.

Hyla carolinensis, Penn., subspecies *semifasciata*, Hallowell, Proc. Acad. Phila., 1856, 306. Texan district.

Hyla pickeringii, Holbrook, N. Am. Herp., iv, pl. 34. Eastern region.

Hyla femoralis, Daudin; Holbrook, N. Am. Herp., iv, p. 31. Eastern part of Austroriparian region.

Hyla versicolor, LeConte; Holbrook, N. Am. Herp., iv, p. 28. Eastern and Austroriparian regions.

Hyla arenicolor, Cope; Baird, U. S. Bound. Surv., 29. Sonoran region.

Hyla cadaverina, Cope; Hallowell, U. S. P. R. R. Surv., x, Williamson's Report, 21. Pacific region.

Hyla gratiosa, LeConte, Proc. Acad. Phila., 1856, 146. Florida; Lower Georgia.

SMILISCA, Cope.

Smilisca baudinii, Dum., Bibr.; Baird, U. S. Bound. Surv., p. 29, pl. xxxviii, figs. 1-3. Lower Rio Grande, Mexico.

CYSTIGNATHIDAE.

LITHODYTES, Cope.

Lithodytes ricordii, Dum., Bibr.; Cope, Proc. Acad. Phila., 1862, 153. Southern Florida (Bahamas; Cuba).

EPIRHEXIS, Cope.

Epirhexis longipes, Baird, U. S. Mex. Bound. Surv., pl. xxxvii, figs 1-3. Lower Rio Grande.

SCAPHIOPIDAE.

SPEA, Cope.

Spea bombifrons, Cope, Proc. Acad. Phila., 1863, p. 53. Central region.

Spea hammondi, Baird; Cope, Proc. Acad. Phila., 1863, p. 53. Pacific region to San Diego.

Spea multiplicata, Cope, loc. cit., p. 52. Near city of Mexico.

SCAPHIOPUS, Holbrook.

Scaphiopus varius, Cope, subspecies *varius*, Cope, loc. cit., p. 52. Lower California.

Scaphiopus varius, Cope, subspecies *rectifrenis*, Cope, loc. cit., p. 53. Sonoran region.

Scaphiopus couchii, Baird; Cope, loc. cit., p. 52. Sonoran region.

Scaphiopus holbrookii, Harlan; Cope, loc. cit., p. 54. Eastern and Austroriparian regions.

RANIFORMIA.

RANIDAE.

RANA, Linn.

Rana arcolata, Baird and Girard, subspecies *capito*, LeConte, Proc. Acad. Phila., 1855, p. 425. Floridan district.

Rana arcolata, Baird and Girard, subspecies *arcolata*, Bd. Gir., U. S. Mex. Bound. Surv., 28, pl. xxxvi, figs. 11-12. Texan district.

Rana montezumae, Baird, U. S. Mex. Bound. Surv., p. 27. Mexican plateau.

Rana halerina, Kalm; Holbrook, N. Am. Herp., iv, p. 91; subspecies *halerina*, Hallowell, Proc. Acad. Phila., 1856, pp. 141, 250. Eastern coast countries of Eastern and Austroriparian regions.

Rana halerina, Kalm, subspecies *berlandieri*, Baird, U. S. Mex. Bound. Surv., p. 27. Entire Interior of North America; Mexico.

Rana palustris, LeConte; Holbrook, N. Am. Herp., iv, p. 95. Eastern region.

Rana septentrionalis, Baird, Proc. Acad. Phila., 1854, p. 61 (*R. sinuata*, Bd.). Canada to Montana.

Rana clamitans, Merrem.; Holbrook, N. Am. Herp., iv, pp. 85-87. Eastern region, Louisianian district.

Rana catesbiana, Shaw; Holbrook, N. Am. Herp., iv, p. 77. Eastern and Austroriparian regions.

Rana temporaria, Linn., subspecies *aurora*, Bd.; Girard, U. S. Expl. Exped. Herp., p. 18.

Rana temporaria, Linn., subspecies *silvatica*, LeConte; Holbrook, N. Am. Herp., iv, p. 24. Eastern region.

Rana temporaria, Linn., subspecies *cantabrigensis*, Baird, Proc. Acad. Phila., 1854, p. 61. Canadian district of Eastern region to Rocky Mountains.

Rana pretiosa, Baird; Girard, U. S. Expl. Exped. Herp., p. 20. Pacific subregion.

OPHIDIA.

SOLENOGLYPHA.

CROTALIDAE.

APLOASPIS, Cope.

Aploaspis lepida, Kennicott, Proc. Acad. Phila., 1861, p. 206. Western Texas.

CROTALUS, Linn.

Crotalus pyrrhus, Cope, Proc. Phila., 1866, p. 308. Central Arizona.

Crotalus mitchellii, Cope, loc. cit., 1861, p. 293. Lower California.

Crotalus cerastes, Hallowell; Baird, U. S. Mex. Bound. Surv., vol. ii, p. 14. Arizona.

Crotalus tigris, Kennicott, U. S. Mex. Bound. Surv., vol. ii, p. 14. Arizona.

Crotalus enyo, Cope, Proc. Acad. Phila., 1861, p. 293. Lower California.

Crotalus horridus, Linn.; Holbrook, N. Am. Herp., iii, p. 9. Eastern and Austroriparian regions.

Crotalus adamanteus, Beauvois, subspecies *adamanteus*, Beauvois; Baird and Girard, N. Am. Serpents, p. 3. North Carolina to Florida.

Crotalus adamanteus, Beauvois, subspecies *atrox*, Baird and Girard, Cat., p. 5. Indian Territory and Texas to Sonora and Southern and Lower California.

Crotalus adamanteus, Beauvois, subspecies *scutulatus*, Kennicott, Proc. Acad. Phila., 1861, p. 207. Arizona.

Crotalus lucifer, Baird and Girard, Cat., p. 6. Pacific subregion; mountains of Arizona.

Crotalus polystictus, Cope, Proc. Acad. Phila., 1865, p. 191. Table land of Mexico.

Crotalus confluentus, Say; Baird and Girard, loc. cit., p. 8. Central and Sonoran regions, entering Texan district of the Austroriparian.

Crotalus molossus, Baird and Girard, Cat., p. 10. Sonoran region, entering the Texan district.

CAUDISONA, Laurenti.

Caudisona rava, Cope, Proc. Acad. Phila., 1865, p. 191. Table land of Mexico.

Caudisona miharia, Linn.; Baird and Girard, Cat., p. 11. Austroriparian region and Sonora.

Caudisona edwardsii, Baird and Girard, Cat., p. 15. Sonoran region.

Caudisona tergemina, Say; Baird and Girard, Cat., p. 14. Eastern region west of the Allegheny Mountains; Georgia.

ANCISTRODON, Beauvois.

Ancistrodon piscivorus, Lacépède, subspecies *piscivorus*, Lacépède; Baird and Girard, Cat., 19. Austroriparian region, except Texas.

Ancistrodon piscivorus, Lacépède, subspecies *pugnax*, Baird and Girard, Cat., p. 20. Texan district.

Ancistrodon contortrix, Linn.; Baird and Girard, Cat., p. 17. Entire Eastern and Austroriparian regions.

Ancistrodon atrofuscus, Troost.; Holbrook, N. Am. Herp., iii, p. 43. Mountains of Tennessee and North Carolina.

PROTEROGLYPHA

ELAPIDAE.

ELAPS, Schneider.

Elaps fulvius, Linn., Baird and Girard, Cat., p. 21; subspecies *fulvius*. Austroriparian region.

Elaps fulvius, Linn., subspecies *tener*, Baird and Girard, Cat., p. 22. Texas.

Elaps curyxanthus, Kennicott, Proc. Acad. Phila., 1860, p. 337. Sonoran region.

Elaps distans, Kennicott, loc. cit., p. 338. Chihuahua; Florida.

ASINEA.

COLUBRIDAE.

CARPHOPHIOPS, Gervais.

Carphophiops helenae, Kennicott, Proc. Acad. Phila., 1859, p. 100. Southern Illinois; Mississippi.

Carphophiops amoenus, Say; Baird and Girard, Cat., p. 129. Massachusetts to Louisiana and Illinois.

Carphophiops vermis, Kennicott, Proc. Acad. Phila., 1859, p. 99. Missouri; Kansas.

VIRGINIA, Baird and Girard.

Virginia harperti, Dum., Bibr., Erpétologie Générale, vol. vi, p. 135. Texas; ?Georgia.

Virginia valeriae, Baird and Girard, Cat., p. 127. Maryland to Illinois and North Carolina.

Virginia elegans, Kennicott, Proc. Acad. Phila., 1859, p. 99. Southern Illinois; Arkansas.

HALDEA, Baird and Girard.

Haldea striatula, Linn.; Baird and Girard, Cat., p. 122. Virginia to Texas.

TANTILLA, Baird and Girard.

Tantilla planiceps, Blainville; Baird and Girard, Cat., p. 154. Lower California.

Tantilla gracilis, Baird and Girard, Cat., p. 132. Texas.

Tantilla hallowellii, Cope, Proc. Acad. Phila., 1861, p. 7. Texas.

Tantilla nigriceps, Kennicott, Proc. Acad. Phila., 1860, 328. Texas; New Mexico; Arizona.

Tantilla coronata, Baird and Girard, Cat., p. 131. Georgia; Mississippi.

ABASTOR, Gray.

Abastor erythrogrammus, Dandin; Baird and Girard, Cat., 125. North Carolina to Alabama.

FARANCIA, Gray.

Farancia abacura, Holbrook; Baird and Girard, Cat., p. 123. Austro-riparian region.

CHILOMENISCUS, Cope.

Chilomeniscus stramineus, Cope, Proc. Acad. Phila., 1860, p. 339. Lower California.

Chilomeniscus ephippicus, Cope, Proc. Acad. Phila., 1867, p. 85. Owen Valley, California (Sonoran subregion).

Chilomeniscus cinctus, Cope, Proc. Acad. Phila., 1861, p. 303. Sonora.

CHIONACTIS, Cope.

Chionactis occipitalis, Hallowell, U. S. Pacific R. R. Survey, vol. x, Williamson's Report, p. 15. Fort Mojave, Arizona.

Chionactis occipitalis, Hallowell, subspecies *annulata*, Kennicott, U. S. Mex. Bound. Surv., vol. ii, p. 22. Colorado Desert, Arizona.

CONTIA, Baird and Girard.

Contia mitis, Baird and Girard, Cat., p. 110. Pacific region.

Contia isozona, Cope, Proc. Acad. Phila., 1866, p. 304. Utah; Arizona.

Contia episcopa, Kennicott, U. S. Mex. Bound. Surv., ii, p. 22. Texas.

Contia pygaea, Cope, Proc. Acad. Phila., 1871, p. 222. Florida.

SONORA, Baird and Girard.

Sonora semiannulata, Baird and Girard, Cat., p. 117. Sonora.

LODIA, Baird and Girard.

Lodia tennis, Baird and Girard, Cat., p. 116. Washington Territory.

GYALOPIMUM, Cope.

Gyalopium canum, Cope, Proc. Acad. Phila., 1860, 243. Arizona.

CEMOPHORA, Cope.

Cemophora coccinea, Blumenbach, Baird and Girard, Cat., p. 118. Austroriparian region.

RHINOCILUS, Baird and Girard.

Rhinocilus lecontei, Baird and Girard, Cat., p. 120. Sonoran and Southern Pacific regions.

OSCEOLA, Baird and Girard.

Osceola elapsoidea, Holbrook; Baird and Girard, Cat., p. 133. Virginia to Florida.

OPHIBOLUS, Baird and Girard.

Ophibolus doliatus, Linn., subspecies *coccineus*, Schlegel; Baird and Girard, Cat., p. 89. Florida to New Mexico; Kansas.

Ophibolus doliatus, Linn., subspecies *amaurus*, Cope, Proc. Acad. Phila., 1860, p. 258.

Ophibolus doliatus, Linn., subspecies *gentilis*, Baird and Girard, Cat., p. 90. Arkansas.

Ophibolus doliatus, Linn., subspecies *annulatus*, Kennicott, Proc. Acad. Phila., 1860, p. 329. Kansas; Arkansas and Texas.

- Ophibolus doliatus*, Linn., subspecies *doliatus*, Linn.; Cope, Proc. Acad., 1860, p. 256. Maryland and Virginia to Kansas; Arkansas, Louisiana, and Texas.
- Ophibolus doliatus*, Linn., var. *triangulus*, Boie; Baird and Girard, Cat., p. 87. From Virginia northward to Canada, Iowa, and Wisconsin.
- Ophibolus multistratus*, Kennicott, Proc. Acad. Phila., 1860, p. 328. Nebraska.
- Ophibolus pyrrhomelas*, Cope, Proc. Acad. Phila., 1866, p. 305. Arizona and California.
- Ophibolus getulus*, Linn., subspecies *boylii*, Baird and Girard, Cat., p. 82. Pacific and Sonoran regions.
- Ophibolus getulus*, Linn., subspecies *conjunctus*, Cope, Proc. Acad. Phila., 1861, 301. Lower California.
- Ophibolus getulus*, Linn., subspecies *splendidus*, Baird and Girard, Cat., p. 83. Sonoran region.
- Ophibolus getulus*, var. *sayi*, Holbrook; Baird and Girard, Cat., p. 84. United States, between the Allegheny and Rocky Mountains, from the Gulf of Mexico to Illinois.
- Ophibolus getulus*, Linn.; subspecies *getulus*, Linn.; Baird and Girard, Cat., p. 85. From Maryland to Florida and Louisiana, east of the Alleghenies.
- Ophibolus californiae*, Blainv.; Baird and Girard, Cat., p. 153. Lower California.
- Ophibolus rhombomaculatus*, Holbrook; Baird and Girard, Cat., p. 86. North Carolina to Georgia.
- Ophibolus calligaster*, Say; Cope, Proc. Acad. Phila., 1860, p. 255. Illinois to Kansas and Arkansas.

DIADOPHIS, Baird and Girard.

- Diadophis punctatus*, Linn., subspecies *punctatus*, Linn.; Baird and Girard, Cat., p. 112. United States and Canada, east of the plains and Texas.
- Diadophis punctatus*, Linn., subspecies *stictogenys*, Cope, Proc. Acad. Phila., 1860, p. 250. Texas.
- Diadophis punctatus*, Linn., subspecies *amabilis*, Baird and Girard, Cat., p. 113. Pacific and Sonoran regions; occasional in Texan district and Central and Eastern regions as far as Ohio.

Diadophis dysopes, Cope, Proc. Acad., 1860, p. 251. Habitat unknown.

Diadophis arnyi, Kennicott, Proc. Acad., 1859, p. 99. Illinois and Kansas.

Diadophis regulis, Baird and Girard, Cat., p. 115. Arizona; Sonora.

CONIOPHANES, Hallowell.

Coniophanes imperialis, Girard, U. S. Mex. Bound. Surv., vol. ii, p. 23. Chihuahua.

HYP SIGLENA, Cope.

Hypsiglena ochrorhyncha, Cope, Proc. Acad., 1860, 246. Lower California north to San Diego.

Hypsiglena ochrorhyncha, Cope, subspecies *chlorophaea*, Cope, loc. cit., 1860, p. 247. Arizona.

SIBON, Fitzinger.

Sibon annulatum, Linn., subspecies *septentrionale*, Kennicott, U. S. Mex. Bound. Surv., vol. ii, p. 16. Southwestern Texas.

TRIMORPHODON, Cope.

Trimorphodon lyrophanes, Cope, Proc. Acad. Phila., 1860, p. 343. Lower California and Arizona.

PHIMOTHYRA, Cope.

Phimothyra grahamiae, Baird and Girard, Cat., p. 104. Lower California and Sonoran regions to Utah and Texas.

Phimothyra grahamiae, Baird and Girard, subspecies *hexalepis*, Cope, Proc. Acad. Phila., 1866, p. 304.

Phimothyra decurtata, Cope, Proc. Acad., 1868, p. 310. Lower California.

DROMICUS, Bibron.

Dromicus flavilatus, Cope, Proc. Acad. Phila., 1871, p. 223. Coast of North Carolina.

CYCLOPHIS, Günther.

Cyclophis vernalis, DeKay; Baird and Girard, Cat., p. 108. Eastern and Austroriparian regions; rare in the latter.

Cyclophis aestivus, Linn.; Baird and Girard, Cat., p. 106. Austroriparian region, and the Eastern as far as New Jersey, Maryland, and Southern Illinois.

COLUBER, Linn.

- Coluber emoryi*, Baird and Girard, Cat., p. 157. Texas and the Mississippi Valley to Kansas and Illinois (*C. calligaster*, Kenn.; *C. rhinomegas*, Cope).
- Coluber lindheimerii*, Baird and Girard, Cat., p. 74. Texas and Arkansas.
- Coluber vulpinus*, Baird and Girard, Cat., p. 75. Massachusetts to Michigan, Kansas and northward (*C. spiloides*, D. & B.).
- Coluber quadrivittatus*, Holbrook; Baird and Girard, Cat., p. 89. North Carolina to Florida.
- Coluber obsoletus*, Say, Kennicott, Proc. Acad. Phila., 1860, p. 330; subspecies *obsoletus*, Say; Baird and Girard, Cat., p. 73. Entire Eastern United States, from Middle Texas to Massachusetts.
- Coluber obsoletus*, Say, subspecies *confinis*, Baird and Girard, Cat., p. 76 (*C. rubriceps*, D. & B.). Austroriparian region; Western Missouri.
- Coluber guttatus*, Linn.; Baird and Girard, Cat., p. 78. Austroriparian region to Central Virginia.

SPILOTES, Wagler.

- Spilotes couperii*, Holbrook; Baird and Girard, Cat., p. 92. Georgia.
- Spilotes crebennus*, Cope; Baird and Girard, Cat., p. 158. Texas to Alabama (*Georgia obsoleta*, B. & G.).

PITYOPHIS, Holbrook.

- Pityophis melanoleucus*, Daudin; Baird and Girard, Cat., p. 65. New Jersey to South Carolina and Ohio.
- Pityophis sayi*, Schlegel, subspecies *sayi*, Schlegel; Baird and Girard, Cat., p. 151. Illinois to Kansas and northward.
- Pityophis sayi*, Schlegel, var. *mexicanus*, Duméril et Bibron, Erp. Gén., vol. vii, p. 236. Sonoran and Central regions, entering the Texan district.
- Pityophis sayi*, Schlegel, var. *bellona*, Baird and Girard, Cat., p. 66. Sonoran and Pacific regions, with Nevada and Utah.
- Pityophis catenifer*, Blainville; Baird and Girard, Cat., p. 69. Pacific region.
- Pityophis vertebralis*, Blainville; Cope, Proc. Acad. Phila., 1860, p. 342 (*P. haematois*, Cope). Lower California.
- Pityophis elegans*, Kennicott, U. S. Mex. Bound. Surv., p. 18. Sonoran region.

BASCANIUM, Baird and Girard.

- Bascanium constrictor*, Linn.; Baird and Girard, Cat., p. 93. Central, Austroriparian, and Eastern regions.
- Bascanium constrictor*, Linn., subspecies *retustum*, Baird and Girard, Cat., p. 97. Pacific region.
- Bascanium anthicum*, Cope, Proc. Acad. Phila., 1862, p. 238. Louisiana(?).
- Bascanium flagelliforme*, Catesb., subspecies *flagelliforme*, Baird and Girard, Cat., p. 98. South Carolina to Florida.
- Bascanium flagelliforme*, Catesb., subspecies *piceum*, Cope, MS. Camp Grant, Arizona.
- Bascanium flagelliforme*, Catesb., subspecies *testaceum*, Say; Baird and Girard, Cat., pp. 99 and 150. Lower Californian and Sonoran regions, with Nevada, Utah, and Texas.
- Bascanium taeniatum*, Hallowell, subspecies *laterale*, Hallowell, Proc. Acad. Phila., 1853. Sonoran and Pacific regions.
- Bascanium taeniatum*, Hallowell, subspecies *taeniatum*, Hallowell; Baird and Girard, Cat., pp. 103 and 160. Pacific and Sonoran regions; Utah and Nevada.
- Bascanium taeniatum*, Hallowell, subspecies *ornatum*, Baird and Girard, Cat., p. 102. Western Texas.
- Bascanium aurigulum*, Cope, Proc. Acad. Phila., 1861, p. 301. Lower California.

CHILOPOMA, Cope.

- Chilopoma rufopunctatum*, Cope, Report on Reptiles of Wheeler's Survey west of one hundredth meridian, 1875 (MS.). Sonoran district.

EUTAENIA, Baird and Girard.

- Eutaenia saurita*, Linn.; Baird and Girard, Cat., p. 24. Austroriparian and Eastern regions.
- Eutaenia sackenii*, Kennicott, Proc. Acad. Phila., 1859, p. 99. Floridan district.
- Eutaenia faireyi*, Baird and Girard, Cat., p. 25. Mississippi Valley, from Louisiana to Wisconsin.
- Eutaenia proxima*, Say; Baird and Girard, Cat., p. 25. Valley of the Mississippi, from Wisconsin to Louisiana; Texas; Northeastern Mexico.
- Eutaenia radix*, Baird and Girard, Cat., p. 34. Central region to Lake Michigan; Oregon.

- Eutaenia macrostemma*, Kennicott, subspecies *megalops*, Kennicott, Proc. Acad. Phila., 1860, p. 330. Sonoran region.
- Eutaenia hammondii*, Kennicott, Proc. Acad. Phila., 1860, p. 332. Pacific region.
- Eutaenia marciiana*, Baird and Girard, Cat., p. 36. Arkansas, Texas, and entire Rio Grande Valley.
- Eutaenia vagrans*, Baird and Girard, subspecies *vagrans*, Baird and Girard, Cat., p. 35. Central, Pacific, and northern parts of Sonoran regions.
- Eutaenia vagrans*, Baird and Girard, subspecies *angustirostris*, Kennicott, Proc. Acad. Phila., 1860, p. 332. Southern Sonoran region.
- Eutaenia elegans*, Baird and Girard, Cat., p. 34. California.
- Eutaenia cyrtopsis*, Kennicott, Proc. Acad. Phila., 1860, p. 333. Lower Californian and Sonoran regions.
- Eutaenia ornata*, Baird, U. S. Mex. Bound. Surv., p. 16. Valley of the Rio Grande del Norte.
- Eutaenia sirtalis*, Linn., subspecies *dorsalis*, Baird and Girard, Cat., p. 31. Entire North America.
- Eutaenia sirtalis*, Linn., subspecies *ordinata*, Linn.; Baird and Girard, Cat., p. 32. Northern part of Eastern region; Nova Scotia; North Alabama.
- Eutaenia sirtalis*, Linn., subspecies *sirtalis*, Linn.; Baird and Girard, Cat., p. 30. North America, excepting the Sonoran, Lower Californian, and southern half of Pacific regions.
- Eutaenia sirtalis*, Linn., subspecies *parietalis*, Say, Long's Exped. Rocky Mts., i, p. 186. Central and Pacific regions; Illinois.
- Eutaenia sirtalis*, Linn., subspecies *obscura*, Cope, MS. Eastern subregion north of Washington; northern part of Pacific region.
- Eutaenia sirtalis*, Linn., subspecies *dorsalis*, Baird and Girard, Cat., p. 31. North America, except the Sonoran and Lower Californian regions.
- Eutaenia sirtalis*, Baird and Girard, subspecies *pickeringii*, Baird and Girard, Cat., p. 29. Pacific region; Minnesota; Texas.
- Eutaenia sirtalis*, Linn., subspecies *tetrataenia*, Cope, MS. Pitt River, California.
- Eutaenia atrata*, Kennicott, Cooper and Suckley's Zool. Wash. Terr., p. 296. California.
- Eutaenia cooperii*, Kennicott, in Cooper and Suckley's Nat. Hist. Wash. Terr., p. 296. Washington and Oregon.

STORERIA, Baird and Girard.

Storeria occipitomaculata, Storer; Baird and Girard, Cat., p. 137. Eastern region; South Carolina; Georgia.

Storeria dekayi, Holbrook; Baird and Girard, Cat., p. 135. Central, Austroriparian, and Eastern regions.

TROPIDOCLONIUM, Cope.

Tropidoclonium storerioides, Cope, Proc. Acad. Phila., 1865, p. 190. Plateau of Mexico.

Tropidoclonium lineatum, Hallowell, Proc. Acad. Phila., 1856. Kansas to Texas.

Tropidoclonium kirtlandii, Kennicott, Proc. Acad. Phila., 1856, p. 95. Illinois; Ohio.

TROPIDONOTUS, Kuhl.

Tropidonotus clarkii, Baird and Girard, Cat., p. 48. Texas.

Tropidonotus grahamii, Baird and Girard, Cat., p. 47. The Mississippi Valley, from Louisiana to Wisconsin; Michigan.

Tropidonotus leberis, Linn.; Baird and Girard, Cat., p. 45. Austroriparian and Eastern regions, including Texas.

Tropidonotus rigidus, Say; Baird and Girard, Cat., p. 46. Pennsylvania to Georgia, east of the Allegheny Mountains.

Tropidonotus validus, Kennicott, subspecies *validus*, Kennicott, Proc. Acad. Phila., 1860, p. 334. Lower Californian and Sonoran regions; Utah.

Tropidonotus validus, Kennicott, subspecies *celaeno*, Cope, Proc. Acad. Phila., p. 341. Lower California.

Tropidonotus compsolaemus, Cope, Proc. Acad. Phila., 1860, p. 368. Florida.

Tropidonotus compressicaudus, Kennicott, Proc. Acad. Phila., 1860, p. 335. Florida.

Tropidonotus ustus, Cope, Proc. Acad. Phila., 1860, p. 340. Florida.

Tropidonotus fasciatus, Linn.; Baird and Girard, Cat., p. 39. Austroriparian region.

Tropidonotus sipedon, Linn., subspecies *sipedon*, Linn.; Baird and Girard, Cat., p. 38. Eastern and Austroriparian regions, excepting Texas.

Tropidonotus sipedon, Linn., subspecies *woodhousei*, Baird and Girard, Cat., p. 42. Texas to Missouri.

Tropidonotus sipedon, Linn., subspecies *couchii*, Kennicott, Proc. Acad., 1860, p. 335. Sonoran region.

Tropidonotus sipedon, Linn., subspecies *erythrogaster*, Shaw; Baird and Girard, Cat., p. 40. Austroriparian region, except Texas; Michigan and Kansas.

Tropidonotus taxispilotus, Holbrook; Baird and Girard, Cat., p. 43. North Carolina to Georgia.

Tropidonotus rhombifer, Hallowell; Baird and Girard, Cat., p. 43. Louisiana to Illinois and Michigan.

Tropidonotus cyclopius, Dum. et Bibron; Cope, Proc. Acad., 1861, p. 299. Florida.

HELICOPS, Wagler.

Helicops allenii, Garman, Proc. Bost. Soc. Nat. Hist., 1874, p. 92. Floridan district.

HETERODON, Beauv.

Heterodon platyrhinus, Latreille; Baird and Girard, Cat., p. 51. Entire Austroriparian and Eastern regions.

Heterodon platyrhinus, Latr., subspecies *atmodes*, Baird and Girard, Cat., p. 57. North Carolina to Georgia.

Heterodon simus, Linn., subspecies *simus*, Baird and Girard, Cat., p. 59. Austroriparian region, excepting Texas.

Heterodon simus, Linn., subspecies *nasicus*, Baird and Girard, Cat., p. 61. Sonoran and Central regions and Texas.

BOIDAE.

CHARINA, Gray.

Charina bottae, Blainv., Nouvelles Annales Mus. Hist. Nat., iii, 1834, 57. Lower Californian region.

Charina plumbea, Baird and Girard, Cat., p. 139. Pacific region; ? Nevada.

LICHANURIDAE.

LICHANURA, Cope.

Lichanura trivirgata, Cope, Proc. Acad. Phila., 1861, p. 304. Lower California.

Lichanura myriolepis, Cope, Proc. Acad. Phila., 1868, p. 2. Lower California.

Lichanura roseifusca, Cope, Proc. Acad. Phila., 1868, p. 2. Lower California.

SCOLECOPHIDIA.

STENOSTOMIDAE.

STENOSTOMA, Wagl.

Stenostoma dulce, Baird and Girard, Cat., p. 142. Sonoran region; Texas.

Stenostoma humile, Baird and Girard, Cat., p. 143. Pacific region.

LACERTILIA.

OPHEOSAURI.

AMPHISBAENIDAE.

RHINEÜRA, Cope.

Rhineüra floridana, Baird; Cope, Proc. Acad. Phila., 1861, p. 75. Floridan district.

PLEURODONTA.

TYPHLOPHITHALMI.

ANIELLIDAE.

ANIELLA, Gray.

Aniella pulchra, Gray. Pacific region, from San Francisco southward.

LEPTOGLOSSA.

SCINCIDAE.

OLIGOSOMA, Girard.

Oligosoma laterale, Say; Holbrook, N. Am. Herp., ii, p. 133. Austro-riparian region; Northwest South Carolina.

EUMECES, Wiegmann.

Eumeces septentrionalis, Baird, Proc. Acad. Phila., 1858, p. 256. Minnesota and Nebraska.

- Eumeces egregius*, Baird, Proc. Acad. Phila., p. 256. Florida.
- Eumeces onocrepis*, Cope, Report of Peabody Academy, Salem., 1869, p. 82. Florida.
- Eumeces tetragrammus*, Baird, Proc. Acad. Phila., 1858, 256. Lower Rio Grande.
- Eumeces anthracinus*, Baird, Jour. Acad. Phila., i, p. 293. Pennsylvania to Texas, in mountains.
- Eumeces inornatus*, Baird, Proc. Acad. Phila., 1856, p. 256. Nebraska.
- Eumeces multivirgatus*, Hallowell, Proc. Acad. Phila., 1857, p. 215. Central region.
- Eumeces leptogrammus*, Baird, Proc. Acad. Phila., 1858, p. 256. Central region.
- Eumeces obsoletus*, Baird and Girard, Proc. Acad. Phila., 1852, p. 129. Sonoran region, and borders of Central and Austroriparian.
- Eumeces guttulatus*, Hallowell; Sitgreaves's Report on Zuni, p. 113. Sonoran region and Western Texas.
- Eumeces skiltonianus*, Baird and Girard; Baird in Stansbury's Report Salt Lake, p. 349. Pacific region.
- Eumeces fasciatus*, Linn.; Holbrook, N. Am. Herp., ii, p. 117, and pp. 121, 127. Central, Austroriparian, and Eastern regions.
- Eumeces longirostris*, Cope, Proc. Acad. Phila., 1861, p. 313. Bermuda Islands.

LACERTIDAE.

XANTUSIA, Baird.

- Xantusia vigilis*, Baird, Proc. Acad. Phila., 1856, p. 255. Pacific sub-region.

TEIDAE.

CNEMIDOPHORUS, Wiegmann.

- Cnemidophorus maximus*, Cope, Proc. Acad. Phila., 1863, p. 104. Lower California.
- Cnemidophorus grahamii*, Baird and Girard, Proc. Acad. Phila., 1852, p. 128. Eastern Sonoran region.
- Cnemidophorus sexlineatus*, Linn.; Holbrook, N. Am. Herp., ii, p. 109. Sonoran and Austroriparian regions, to Southeast Virginia.
- Cnemidophorus inornatus*, Baird, Proc. Acad. Phila., 1858, p. 255. Southern Sonoran region.
- Cnemidophorus octolineatus*, Baird, Proc. Acad. Phila., 1858, p. 255. Southern Sonoran region.

Cnemidophorus perplexus, Baird and Girard, Proc. Acad. Phila., 1852, p. 128. Rio Grande Valley.

Cnemidophorus tessellatus, Say, subspecies *tessellatus*, Say; Baird, U. S. P. R. R. Surv., x, Beckwith's Report, p. 18. Southern Colorado.

Cnemidophorus tessellatus, Say, subspecies *tigris*, Baird and Girard; Stansbury's Report Salt Lake, p. 338. Pacific and Sonoran regions to Utah.

Cnemidophorus tessellatus, Say, subspecies *melanostethus*, Cope, Proc. Acad. Phila., 1863, p. 104. Southeast Arizona.

Cnemidophorus tessellatus, Say, subspecies *gracilis*, Baird and Girard, Proc. Acad. Nat. Sci. Phila., 1852, 128. Southeast Arizona.

VERTICARIA, Cope.

Verticaria hyperythra, Cope, Proc. Acad. Phila., 1863, p. 103. Lower California to San Diego.

DIPLOGLOSSA.

ANGUIDAE.

OPHEOSAURUS, Daudin.

Ophosaurus ventralis, Daudin; Holbrook, N. Am. Herp., ii, p. 139. Austroriparian region; Tennessee; Kansas.

GERRHONOTIDAE.

BARISSIA, Gray.

Barissia olivacea, Baird, Proc. Acad. Phila., 1858, p. 255. Southern California.

GERRHONOTUS, Wiegmann.

Gerrhonotus nobilis, Baird and Girard, Proc. Acad. Phila., 1852, p. 129. Sonora.

Gerrhonotus principis, Baird and Girard, Proc. Acad. Phila., 1852, p. 175. Northern Pacific region.

Gerrhonotus multicarinatus, Blainville (*G. formosus*), Baird and Girard, Proc. Acad. Phila., 1852, p. 175. Pacific and Lower Californian regions.

Gerrhonotus grandis, Baird and Girard, Proc. Acad. Phila., 1852, p. 176. Pacific region.

- Gerrhonotus scincicaudus*, Skilton, Am. Jour. Sci. Arts, 1849, p. 202.
Pacific and Lower Californian regions.
- Gerrhonotus infernalis*, Baird and Girard; Cope, Proc. Acad. Phila., 1866, 322. Western Texas.

HELODERMIDAE.

HELODERMA, Wiegmann.

- Heloderma suspectum*, Cope; Baird, U. S. Bound. Surv., plate xxvi.
Sonoran region.

IGUANIA.

IGUANIDAE.

HOLBROOKIA, Girard.

- Holbrookia maculata*, Girard, subspecies *maculatu*, Girard; Stansbury's Report, 1852, p. 342. Central and Sonoran subregions.
- Holbrookia maculata*, Girard, subspecies *propinqua*, Baird and Girard, Proc. Acad. Phila. 1852, p. 126. Texas.
- Holbrookia texana*, Troschel; Baird and Girard, Proc. Acad. Phila., 1852, p. 125. Sonoran region; Western Texas.

CALLISAURUS, Blainville.

- Callisaurus draconoides*, Blainv., subspecies *ventralis*, Hallowell; Sitgreave's Report Zuñi, p. 117. Sonoran region.
- Callisaurus draconoides*, Blainv., subspecies *gabbii*, Cope, MS. Northern Lower California.
- Callisaurus draconoides*, Blainv., subspecies *draconoides*, Blainv., Nouv. Ann. de Mus., p. 426. Southern Lower California.

UMA, Baird.

- Uma notata*, Baird, Proc. Acad. Phila., 1858, p. 253. Sonora region.

SAUROMALUS, Duméril.

- Sauromalus ater*, Duméril; Baird, U. S. and Mex. Bound. Surv., p. 6.
Sonoran region.

CROTAPHYTUS, Holbrook.

- Crotaphytus collaris*, Say; Holbrook, N. Am. Herp., ii, p. 79. Sonoran region; Central region to latitude 40°.

Crotaphytus wislizenii, Baird and Girard, Stansbury's Report Salt Lake, p. 340. Pacific and Sonoran regions; Nevada, Utah.

Crotaphytus reticulatus, Baird, Proc. Acad. Phila., 1858, p. 253. Western Texas.

DIPSOSAURUS, Hallowell.

Dipsosaurus dorsalis, Baird and Girard, Proc. Acad. Phila., 1852, p. 126. Lower Californian, Southern Pacific, and Sonoran regions.

UTA, Baird and Girard.

Uta thalassina, Cope, Proc. Acad. Phila., 1863, p. 104. Lower California.

Uta graciosa, Hallowell, Proc. Acad. Phila., 1854, p. 92. Pacific region.

Uta nigricauda, Cope, Proc. Acad. Phila., 1864, p. 176. Lower California.

Uta schottii, Baird, Proc. Acad. Phila., 1858, p. 253. Southern California.

Uta ornata, Baird and Girard, Proc. Acad. Phila., 1852, p. 126. Sonoran region.

Uta stansburiana, Baird and Girard, Stansbury's Report Salt Lake, p. 345. Pacific, Lower Californian, and Sonoran regions; Nevada, Utah.

SCELOPORUS, Wiegmann.

Sceloporus ornatus, Baird, U. S. Mex. Bound. Surv., p. 5. Southeastern Sonoran region.

Sceloporus jarrovi, Cope, MS., Zoöl. Wheeler's Expl. west of the 100th merid., 1875. Sonoran region (Southern Arizona).

Sceloporus poinsettii, Baird and Girard, Proc. Acad. Phila., 1852, p. 126. Sonoran region.

Sceloporus torquatus, Peale and Green, Proc. Acad. Phila., ii, p. 131. Southern Sonoran region.

Sceloporus couchii, Baird, Proc. Acad. Phila., 1858, p. 254. Southern Sonoran region.

Sceloporus marmoratus, Hallowell, Proc. Acad. Phila., 1852, p. 178. Sonoran region; Utah.

Sceloporus biserialis, Hallowell, U. S. P. R. R. Surv., x, Williamson's Report, p. 6. ?Habitat.

Sceloporus undulatus, Harlan, subspecies *undulatus*, Harlan; Holbrook, Am. Herp., ii, p. 73. North America, except Sonoran and Lower Californian regions.

Sceloporus undulatus, Harlan, subspecies *thayerii*, Baird and Girard, Proc. Acad. Phila., 1852, p. 127. California, Utah, New Mexico, and Rio Grande Valley.

Sceloporus consobrinus, Baird and Girard; Marcy's Report Red River, 1853, p. 237. Sonoran and Central regions; Oregon and Texas.

Sceloporus scalaris, Wiegmann, Herpetologia Mexicana, 1834, p. 52. Sonora.

Sceloporus floridanus, Baird, Proc. Acad. Phila., 1858, p. 254. Florida.

Sceloporus spinosus, Wiegmann, Herpetologia Mexicana, p. 50. Texas.

Sceloporus clarkii, Baird and Girard, subspecies *clarkii*, Baird and Girard, Proc. Acad. Phila., 1852, p. 127. Sonoran and Southern Pacific regions.

Sceloporus clarkii, Baird and Girard, subspecies *zosteromus*, Cope, Proc. Acad. Phila., 1863, p. 105. Lower California.

PHRYNOSOMA, Wiegmann.

Phrynosoma modestum, Girard, Stansbury's Rept. Salt Lake, p. 365. Sonoran region.

Phrynosoma platyrhinum, Girard, Stansbury's Rept. Salt Lake, p. 361. Utah and Nevada.

Phrynosoma maccallii, Hallowell; Baird, U. S. Mex. Bound. Surv., p. 9. Desert of Gila and Colorado.

Phrynosoma regale, Girard, U. S. Mex. Bound. Surv., p. 9. Desert of Gila and Colorado.

Phrynosoma planiceps, Hallowell, Proc. Acad. Phila., 1852, p. 178. Southern Sonoran region.

Phrynosoma cornutum, Harlan; Girard, Stansbury's Rept. Salt Lake, p. 360. Texas.

Phrynosoma hernandezii, Girard, Herp. U. S. Expl. Exped., p. 395. New Mexico; Rio Grande Valley.

Phrynosoma douglassii, Bell, subspecies *ornatissimum*, Girard, Herp. U. S. Expl. Exped., 1858, p. 396. Sonoran region.

Phrynosoma douglassii, Bell, subspecies *douglassii*, Bell; Girard, Herp. U. S. Expl. Exped., p. 398. Entire Central region; Oregon and Washington.

Phrynosoma blainvillei, Gray; Girard, U. S. Expl. Exped. Herp., p. 400. Pacific region.

Phrynosoma coronatum, Blainville, Nouv. Mém. Museum, iv, p. 28. Lower California.

CYCLURA, Harlan.

Cyclura hemilopha, Cope, Proc. Acad. Phila., 1863, p. 105. Lower California.

ANOLIDAE.

ANOLIS, Merrem.

Anolis principalis, Linn.; Holbrook, N. Am. Herp., ii, 67. Austroriparian region.

Anolis cooperii, Baird, Proc. Acad. Phila., 1868, p. 254. ?California.

NYCTISAURA.

GECCONIDAE.

COLEONYX, Gray.

Coleonyx variegatus, Baird, U. S. Mex. Bound. Surv., p. 12. Sonoran region.

SPHAERODACTYLUS, Cuv.

Sphaerodactylus notatus, Baird, U. S. Mex. Bound. Surv., p. 12. Key West, Fla. (Cuba).

PHYLLODACTYLUS, Gray.

Phyllodactylus tuberculosus, Wiegmann, Nova Acta. K. L. C. Acad., xvii, p. 241. Sonoran region.

Phyllodactylus xanti, Cope, Proc. Acad. Phila., p. 102. Lower California.

DIPLODACTYLUS, Gray.

Diplodactylus unctus, Cope, Proc. Acad. Phila., 1863, p. 102. Lower California.

TESTUDINATA.

ATHECAE.

SPHARGIDIDAE.

SPHARGIS, Merrem.

Sphargis coriacea, Rondelet; Holbrook, N. Am. Herp., ii, p. 45. Atlantic coast to Massachusetts.

CRYPTODIRA.

CHELONIIDAE.

THALASSOCHELYS, Fitz.

Thalassochelys eaouana, Linn.; Holbrook, N. Am. Herp., ii, p. 33. Entire Atlantic coast.

ERETMOCHELYS, Fitz.

Eretmochelys imbricata, Linn.; Holbrook, N. Am. Herp., ii, p. 39. Southern Atlantic coast.

Eretmochelys squamata, Linn.; Agassiz, Cont. Nat. Hist. U. S., i, p. 382. Pacific coast.

CHELONIA, Brong.

Chelonia mydas, Schw.; Holbrook, N. Am. Herp., ii, p. 25. Atlantic coast south of Long Island.

Chelonia virgata, Schw.; Agassiz, Cont., i, p. 379. Pacific coast.

TRIONYCHIDAE.

AMYDA, Agassiz.

Amyda mutica, Lesueur, Mém. du Mus. d'Hist. Nat., xv, p. 263. Middle and northern tributaries of the Mississippi, and the Saint Lawrence.

ASPIDONECTES, Wagl.

Aspidonectes ferox, Schweigger; Holbrook, N. Am. Herp., ii, p. 11. Georgia to Western Louisiana.

Aspidonectes spinifer, Lesueur, Mém. de Mus. d'Hist. Nat., xv, p. 258. Middle and northern tributaries of the Mississippi, and Saint Lawrence.

Aspidonectes asper, Agassiz, Cont. Nat. Hist. U. S., i, p. 405. Lower Mississippi tributaries.

Aspidonectes nuchalis, Agassiz, Cont. Nat. Hist. U. S., i, p. 406. Cumberland and Upper Tennessee Rivers, Tennessee.

Aspidonectes emoryi, Agassiz, Cont. Nat. Hist. U. S., i, p. 407. Texas.

CHELYDRIDAE.

CHELYDRA, Schw.

Chelydra serpentina, Linn.; Holbrook, N. Am. Herp., i, p. 139. From Canada to Ecuador. Wanting in the Pacific subregion.

MACROCHELYS, Gray.

Macrochelys lacertina, Schweigger; Holbrook, N. Am. Herp., i, p. 147. Tributaries of the Gulf of Mexico, from Florida to Western Texas, extending to Missouri in the Mississippi.

CINOSTERNIDAE.

AROMOCHELYS, Gray.

Aromochelys odoratus, Latreille; Holbrook, N. Am. Herp., i, p. 133. Austroriparian and Eastern subregions.

Aromochelys carinatus, Gray; Agassiz, Cont., i, p. 423. Louisianian district.

CINOSTERNUM, Wagl.

Cinosternum pennsylvanicum, Bosc, subspecies *pennsylvanicum*, Bosc; Holbrook, N. Am. Herp., i, p. 127. Austroriparian (?Texas) and Eastern subregions.

Cinosternum pennsylvanicum, Bosc, subspecies *doubledayi*, Gray, Cat. Tort., Crocod., and Amphib. B. M., p. 33. Southwestern United States.

Cinosternum sonoriense, LeConte, Proc. Acad. Phila., 1854, p. 183. Arizona.

Cinosternum flavescens, Agassiz, Contrib. Nat. Hist. U. S., i, p. 430. Arizona.

Cinosternum henrici, LeConte, Proc. Acad. Phila., 1854, p. 182. Sonoran subregion.

EMYDIDAE.

PSEUDEMYIS, Gray.

Pseudemys rugosa, Shaw; Holbrook, N. Am. Herp., i, p. 55. New Jersey to Virginia.

Pseudemys concinna, LeConte; Holbrook, N. Am. Herp., i, pp. 119, 65. Austroriparian region (?Texas).

Pseudemys mobiliensis, Holbrook, N. Am. Herp., i, p. 71. Florida to the Rio Grande of Texas.

Pseudemys hieroglyphica, Holbrook, N. Am. Herp., i, p. 111. Middle, Western, and Gulf States.

Pseudemys scabra, Linu.; Holbrook, N. Am. Herp., i, p. 49. North Carolina to Georgia.

Pseudemys troostii, Holbrook, N. Am. Herp., i, p. 123. Valley of the Mississippi to Illinois.

Pseudemys elegans, Wied.; Holbrook, N. Am. Herp., i, p. 115. Central region and Texan district.

MALACOCLEMMYS, Gray.

Malacoclemmys geographicus, Lesueur; Holbrook, N. Am. Herp., i, p. 99. Mississippi Valley to Pennsylvania and New York.

Malacoclemmys pseudogeographicus, Holbrook, N. Am. Herp., i, p. 103. Mississippi Valley to Wisconsin and Northern Ohio.

Malacoclemmys palustris, Gmelin; Holbrook, N. Am. Herp., i, p. 87. Coast from New York to Texas.

CHRYSEMYS, Gray.

Chrysemys picta, Herm.; Holbrook, N. Am. Herp., i, p. 75. Eastern region; Louisiana, Mississippi.

Chrysemys oregonensis, Harlan; Holbrook, N. Am. Herp., i, p. 107. Central region.

Chrysemys reticulata, Bose; Holbrook, N. Am. Herp., i, p. 59. Gulf States.

CHELOPUS, Rafinesque.

Chelopus guttatus, Schneider; Holbrook, N. Am. Herp., i, p. 81. Eastern region east of Ohio.

Chelopus muhlenbergii, Schweigger; Holbrook, N. Am. Herp., vol. i, p. 45. New Jersey and Eastern Pennsylvania.

Chelopus insculptus, LeConte; Holbrook, N. Am. Herp., i, p. 93. Eastern region east of Ohio.

Chelopus marmoratus, Baird and Girard; Hallowell, U. S. P. R. R. Surv., x, Williamson's Report, p. 3. Pacific region.

EMYS, Brong.

Emys meleagris, Shaw; Holbrook, N. Am. Herp., i, p. 39. Alleghenian district of Eastern region to Wisconsin.

CISTUDO, Flem.

Cistudo clausa, Gm., subspecies *clausa*, Gm.; Holbrook, N. Am. Herp., i, p. 31. Eastern region and Louisianian and Floridan districts.

Cistudo clausa, subspecies *triunguis*, Agass., Contrib., i, p. 445. Austro-riparian region to Georgia; Eastern Pennsylvania.

Cistudo ornata, Agass., Contrib., i, p. 445. Central region.

TESTUDINIDAE.

TESTUDO, Linn.

Testudo carolina, Linn.; Holbrook, N. Am. Herp., i, p. 25. Austroriparian region, not north of South Carolina.

Testudo agassizii, Cooper, Proc. Calif. Acad. Sci.* Southern Pacific and Western Sonoran regions.

CROCODILIA.

CROCODILIDAE.

ALLIGATOR, Cuv.

Alligator mississippiensis, Daudin; Holbrook, N. Am. Herp., vol. ii, p. 53. Austroriparian region.

CROCODILUS, Cuv.

Crocodylus americanus, Seba.; Dum. et Bib., Erp. Gén., iii, p. 119. Floridan district.

Enumeration of genera and species.

| | Genera. | Species. | |
|--------------------|---------|----------|-----|
| BATRACHIA. | | | |
| Trachystomata..... | 2 | 2 | |
| Proteida..... | 1 | 2 | |
| Urodela..... | 15 | 49 | |
| Anura..... | 11 | 48 | |
| | 29 | | 101 |
| REPTILIA. | | | |
| OPHIDIA. | | | |
| Solenoglypha..... | 4 | 18 | |
| Proteroglypha..... | 1 | 3 | |
| Asinea..... | 36 | 109 | |
| Scolecophidia..... | 1 | 2 | |
| | 42 | | 132 |
| LACERTILIA. | | | |
| Opheosauri..... | 1 | 1 | |
| Pleurodonta..... | 22 | 76 | |
| Nyctisaura..... | 3 | 5 | |
| | 26 | | 82 |
| TESTUDINATA. | | | |
| Athecae..... | 1 | 1 | |
| Cryptodira..... | 16 | 40 | |
| | 17 | | 41 |
| CROCODILIA..... | 2 | | 2 |
| | | | 257 |
| Total species..... | | | 358 |

* Referred to, vol. for 1870, p. 67.

PART III.
ON GEOGRAPHICAL DISTRIBUTION
OF THE
VERTEBRATA OF THE REGNUM NEARCTICUM,
WITH ESPECIAL REFERENCE TO THE
BATRACHIA AND REPTILIA.

I.—THE FAUNAL REGIONS OF THE EARTH.

As is well known, the life of the different regions of the earth presents marked peculiarities. The differences are, in some measure, connected with the geographical and topographical relations of the continents. To each of them, peculiar divisions of animals are found to be confined; and the sum of these, or the “fauna,” is found in each case to present marked characters. The districts thus marked out are the *Australian* (which includes Australia, Van Diemen’s Land, New Guinea, etc.); the *Neotropical*, including South America, the West Indies, and Mexico; the *Nearctic*, or North America; the *Ethiopian*, or Africa south of the Desert of Sahara; the *Palaeotropical*, which embraces India and the adjacent islands; and, lastly, the *Palaearctic*, or Asia north of the Himalaya, Europe, and Africa north of the Great Desert. These six districts are variously related by common forms, as well as distinguished by different ones. The name of “realms” has been given to them.

The Australian realm is peculiar in the absence of nearly all types of mammalia, except the *Ornithodelphia* and the Marsupials; in the presence of various Struthions birds; in great development of the *Elapid* serpents, and absence of the higher division of both snakes and frogs (*i. e.*, *Solenoglypha* and *Raniformia*); in the existence of *Dipnoi* (*Ceratodus*) and certain Characinid fishes. On the other hand, many of the lizards and birds are of the higher types that prevail in India and Africa, viz, the *Acrodonta* and the *Oscines*.

The polar hemispheres each possess certain common forms which are not found in the other. Thus, in the southern, which is here understood as embracing the three realms called Australian, Neotropical, and

Ethiopian,* the *Sirenian* mammalia; *Struthious* birds; *Elapid* and *Pelopodous* snakes; *Dipnoan*, *Chromid*, and *Characin* fishes; and *Pleurodire* tortoises, are universal, and not, or very sparsely, found in the northern. Of other groups peculiar to the Southern or Equatorial regions, the *Edentate* mammalia belong to the Neotropical and Ethiopian; the *Osteoglossid* fishes to the Neotropical, Palaeotropical, and Australian; while monkeys occur in the southern faunae, except the Australian, and in the Palaeotropical. The Ethiopian shares many peculiarities with the Northern. Thus, Insectivorous mammals, Viperine snakes, and Raniform frogs, are only found here in the southern hemisphere.

The Neotropical realm only possesses exclusively the Platyrrhine monkeys and the great majority of the humming-birds. It shares with other Southern regions the Edentate and Tapiroid mammals; Struthious, Pullastrine, and Clamatorial birds; Elapid snakes; Arciferous frogs; and Characin, Chromid, Osteoglossid, and Dipnoan fishes. It has but few types of the Northern regions; these are numerous pleurodont Lacertilia, the Aerodonts being entirely absent; and a few bears, deer, and Oscine birds.

The Ethiopian realm is that one which combines the prevalent features of the Palaearctic region with the southern-hemisphere types already mentioned, together with some found elsewhere only in the Palaeotropical, and a very few peculiar. The two latter classes not being mentioned elsewhere, they may be here enumerated. This region shares, with the Indian alone, the Catarrhine monkeys, the *Elephantidae* *Rhinocerotidae*, and *Chamaeleons*. Its peculiar types are the *Lemuridae*, *Hippopotamidae*, and *Cameleopardalidae*, among mammals, and *Polypteridae* and *Mormyridae* among fishes.

The Northern realms of the earth agree in possessing all the earless seals; but most of its common characters are shared by India and Africa. With these regions they possess most all of the Ruminant and Insectivorous mammals, and all the Raniform frogs. The Palaearctic and Palaeotropical are very much alike, and ought probably to be united. The latter differs in possessing monkeys, elephant, rhinoceros, and tapir, *Elapid* serpents (cobras), and *Osteoglossid* fishes. In other respects, as in mammalia generally, Oscine birds and fresh-water fishes, and reptiles generally, it agrees with Northern Asia and Europe.

The Nearctic or North American realm is that with which we have here to do. It extends from the Arctic regions to a line drawn across Northern Mexico, and includes the peninsula of Lower California. It

* "Eogaea" of Gill, characterized in his article "On the geographical distribution of Fishes", in the "Annals and Magazine of Natural History" (4), xv, 255.

agrees in many points with the northern fauna of the Old World, and has been united with it by some authors; but its peculiar types, and those which it shares with South America, are too numerous for such an arrangement. Its relations are exhibited in the following table :

| Agrees with Palaearctic in— | Differs from Palaearctic in— | |
|-----------------------------|------------------------------|--|
| | Peculiar forms. | Neotropical forms. |
| Mammalia in general..... | | Bassarididae. Procyonidae. Megadermatidae. Dicotyles. Didelphys. |
| | Antilocapra | Cathartidae. |
| | Mephitis | Tanagridae. Icteridae. Clamatores in general. Trochilidae. |
| Birds except..... | | Meleagridae |
| | | Odontophoriinae. Alligators. Amivid and Gerrhonotid lizards. Iguanid lizards. |
| Emyd tortoises | Chelydra | Cinosternidae. Solenoglyph and Elapid venomous snakes. |
| Raniform frogs | Scaphiopodidae | Arcifera. |
| | Plethodontidae. | |
| | Amblystomidae. | |
| Diemictylus. | | |
| Megalobatrachus | Trachystomata. | |
| | Necturus. | |
| | Amphiumidae. | |
| Percid fishes..... | Aphredoderidae | Siluridae. |
| Cottidae. | | |
| Haplomi | Hypsaeidae. | |
| Accipenseridae. | | |
| Spatulariidae. | | |
| Cyprinidae | Plagopterinae. | |
| Gasterosteidae. | Catostomidae. | |
| | | |
| | Amiidae. | |
| | Lepidosteidae. | |
| Petromyzon. | | |

The special peculiarities of the Nearctic region are then chiefly seen in the Fishes and Batrachia. In Birds and Mammals, its prominent divergences from the northern regions of the Old World are seen in the numerous representatives of forms which are characteristically South

American. Of these, the birds offer many genera peculiar to North America, while the few Mammalia are of Neotropical genera. The greatest resemblance between the North American and Palaearctic region is seen in the Mammalia. Around the Arctic regions as well as further south, several species, both of Mammalia and Birds, are identical.

Among Mollusks there is also much resemblance. *Anodonta*, *Unio*, and *Succinea* are common to both the northern faunae, but have no common species; all three greatly predominate in numbers in North America. The snails of the west coast are very European in character, but there are but few *Pupae* in the Regio Neartica, and no *Clausiliae*, and *Bulimus* is represented by few species.

II.—NUMBER OF SPECIES.

The numbers of the Vertebrata found in the Neartic realm are nearly as follows:

MAMMALIA:

| | |
|---|-----|
| <i>Monotremata</i> | 0 |
| <i>Marsupialia</i> | 1 |
| <i>Edentata</i> | 1 |
| <i>Rodentia</i> | 139 |
| <i>Insectivora</i> | 28 |
| <i>Chiroptera</i> | 23 |
| <i>Cetacea</i> | 42 |
| <i>Sirenia</i> | 1 |
| <i>Hydracoida</i> | 0 |
| <i>Proboscidea</i> | 0 |
| <i>Perissodactyla</i> | 0 |
| <i>Artiodactyla</i> { <i>Omnivora</i> | 1 |
| { <i>Ruminantia</i> | 14 |
| <i>Carnivora</i> { <i>Pinnipedia</i> | 13 |
| { <i>Fissipedia</i> | 46 |
| <i>Primates</i> | 1 |

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AVES:

| | |
|--|-----|
| <i>Passeres</i> { <i>Oscines</i> | 306 |
| { <i>Clamatores</i> | 33 |
| <i>Zygodactyli</i> | 36 |
| <i>Syndactyli</i> | 20 |

AVES—Continued.

| | | |
|-----------------------------|-------|-----|
| <i>Psittaci</i> | 1 | |
| <i>Accipitres</i> | 61 | |
| <i>Pullastræ</i> | 12 | |
| <i>Gallinae</i> | 22 | |
| <i>Brevipennes</i> | 0 | |
| <i>Grallæ</i> | 81 | |
| <i>Lamellirostres</i> | 49 | |
| <i>Steganopodes</i> | 13 | |
| <i>Longipennes</i> | 71 | |
| <i>Pygopodes</i> | 51 | |
| | <hr/> | 756 |

REPTILIA :

| | | |
|--------------------------|-------|-----|
| <i>Crocodylia</i> | 2 | |
| <i>Testudinata</i> | 41 | |
| <i>Lacertilia</i> | 82 | |
| <i>Ophidia</i> | 132 | |
| | <hr/> | 257 |

BATRACHIA :

| | | |
|----------------------------|-------|-----|
| <i>Anura</i> | 48 | |
| <i>Urodela</i> | 49 | |
| <i>Gymnophidia</i> | 0 | |
| <i>Proteida</i> | 2 | |
| <i>Trachystomata</i> | 2 | |
| | <hr/> | 101 |

PISCES :

| | | |
|----------------------|-----------------------------|-----|
| <i>Percomorphi</i> { | <i>Pharyngognathi</i> | 12 |
| | <i>Labyrinthici</i> | 0 |
| | <i>Distegi</i> | 178 |
| | <i>Rhegnopteri</i> | 2 |
| | <i>Epilasmia</i> | 18 |
| | <i>Scyphobranchii</i> | 77 |
| | <i>Haplodoci</i> | 3 |
| | <i>Anacanthini</i> | 36 |
| | <i>Heterosomata</i> | 22 |
| | <i>Plectognathi</i> | 30 |
| | <i>Pediculati</i> | 8 |
| | <i>Hemibranchii</i> | 20 |
| | <i>Lophobranchii</i> | 7 |
| | <i>Syngnathii</i> | 10 |
| | <i>Percosoces</i> | 13 |

PISCES—Continued.

| | |
|-----------------------------------|--------|
| <i>Haplomi</i> | 34 |
| <i>Isospondyli</i> | 70 |
| <i>Plectospondyli</i> | 150 |
| <i>Scyphophori</i> | 0 |
| <i>Nematognathi</i> | 27 |
| <i>Notacanthi</i> | 0 |
| <i>Glaucencheli</i> | 0 |
| <i>Ichthyocephali</i> | 0 |
| <i>Holostomi</i> | 0 |
| <i>Euchelycephali</i> | 2 |
| <i>Colocephali</i> | 3 |
| <i>Halecomorphi</i> | 2 |
| <i>Ginglymodi</i> | 15 |
| <i>Glaniostomi</i> | 30 |
| <i>Selachostomi</i> | 1 |
| <i>Holocephali</i> | 2 |
| <i>Plagiostomi</i> | 46 |
| <i>Dipnoi</i> | 0 |
| | <hr/> |
| | 816 |
| DERMOPTERI | 8 |
| LEPTOCARDII | 1 |
| | <hr/> |
| Total species of Vertebrata | 2, 249 |

This number is considerably below the truth, as many of the fishes, both of the ocean and of the fresh waters, remain undescribed.

It is more difficult to state the number of species of the inferior divisions of the animal kingdom. It is asserted that 8,000 species of Coleopterous insects have been discovered in the Neartic region, and that this is probably about two-thirds of the whole. This would give 12,000 species of this the most numerous order, and the *Lepidoptera*, *Hymenoptera*, and *Diptera* will follow at no great distance. Probably 50,000 is below the mark as an estimate of the number of species of insects of this region. One thousand species are to be added for the remaining *Arthropoda*—say, 200 *Myriopoda*, 400 *Arachnida*, and 400 *Crustacea*. Of worms of land and water there are numerous species, the greater proportion of which are not yet known to science.

The number of the *Mollusca* and *Molluscoida* from the coasts and interior of the North American region is about 1,824, of which only 400 are marine. Of the remainder, 1,034 live in the numerous rivers and lakes,

and 400 are terrestrial and air-breathers. They are distributed among the classes as follows:

| | |
|------------------------|------------------------|
| CEPHALOPODA..... | 25 |
| PULMONATA..... | 400 |
| PROSOBRANCHIATA | { Fresh-water..... 438 |
| | { Marine..... 297 |
| HETEROPODA..... | 28 |
| OPISTHOBRANCHIATA..... | 53 |
| PTEROPODA..... | 25 |
| SCAPHOPODA..... | 4 |
| LAMELLIBRANCHIATA | { Fresh-water..... 596 |
| | { Marine..... 377 |

MOLLUSCOIDA.

| | |
|------------------|----|
| BRACHIOPODA..... | 10 |
| ASCIDIA..... | 30 |
| BRYOZOA..... | 39 |

The remaining divisions of the animal kingdom may be estimated to number nearly as follows:

ECHINODERMATA (123).

| | East coast. | Interior. | West coast. |
|------------------|-------------|-----------|-------------|
| HOLOTHURIDA..... | 32 | .... | 4 |
| ECHINOIDEA..... | 50 | .... | 18 |
| CRINOIDEA..... | 2 | .... | .... |
| ASTEROIDEA..... | 17 | .... | ? |

COELENTERATA (144).

| | | | |
|---------------------------|------|------|------|
| MEDUSAE : | | | |
| <i>Discophora</i> | 80 | .... | 22 |
| <i>Siphonophora</i> | 3 | .... | 2 |
| CTENOPHORA..... | 12 | .... | 2 |
| POLYPI..... | 13 | .... | 7 |
| HYDROIDEA..... | .... | 3 | .... |

The divisions of *Protozoa* are well represented in our waters, but the numbers of our *Spongiida*, INFUSORIA and RHIZOPODA, have not yet been ascertained.

III.—RELATIONS TO OTHER REALMS.

It has been already remarked that several species of *Vertebrata* are common to our northern regions and Europe, Asia, etc. Thus, the

wolf extends throughout the northern hemisphere; the same may be said of the fox, the ermine, and, perhaps, of the beaver. It is not improbable that our buffalo (*Bos americanus*) is a variety only of the *B. bison* of the Old World, and that the grizzly bear (*Ursus horribilis*) bears the same relation to the European brown bear (*U. arctos*). There are also certain corresponding or representative species; thus, our red fox (*Vulpes fulvus*) is nearly related to the European fox (*V. vulgaris*), and the red squirrel (*sciurus hudsonicus*) to the *S. vulgaris* of Europe. The elk and moose (*Cervus canadensis* and *Alces americanus*) respectively answer to the *C. elaphus* and *Alces europaeus*.

The majority of American deer belong to a peculiar group (*Cariacus*) mainly characteristic of the Nearetic realm; while the species of the orders *Rodentia* and *Insectivora* are mostly of characteristically distinct species or higher groups.

Among birds, similar relations prevail. The singing-birds are the most characteristic of any continent, and here we find in North America the greatest number of species, genera, and families of birds which differ from those of the Old World. Of the latter, true thrushes, swallows, shrikes, and crows occur, but in limited numbers; while the genera of finches are mostly distinct, and the vireos, tanagers, wood-warblers, Icteridae, and mock-thrushes, which form the bulk of our avifauna, do not exist in the Old World. On the other hand, starlings, flycatchers, and warblers are absent from North America.

As we direct our observation to birds of extended flight, as the *Accipitres* and water-birds, cases of identity of species of opposite continents become more frequent. This is mostly confined here, also, to the northern regions. The marsh-hawk (*Circus cyaneus*), peregrine falcon, fish-hawk, and golden eagle are examples among Falconidae. Among owls, the cases are still more numerous; such are *Nyctea nivea*, *Surnia ulula*, *Otus brachyotus*, *Strix flammea*. Some of these present geographical varieties. Corresponding species are common here, *e. g.*, the American—

Haliaëtus leucocephalus to *H. albicilla* of Europe;

Buteo swainsonii to *B. vulgaris*;

Falco sparverius to *F. tinnunculus*;

Falco columbarius to *F. aesalon*;

Bubo virginianus to *B. maximus*;

Otus vilsonianus to *O. vulgaris*;

etc.,

etc.

The Nearctic realm possesses a peculiar family, the *Cathartidae* (turkey-buzzards), which the Old World lacks, but has no vultures properly so-called.

There are several wading-birds common to the two continents; and cases of identity among the ducks, gulls, and divers are relatively still more numerous. The Gallinae are, on the other hand, entirely distinct, though not without a few corresponding species.

Among lower Vertebrata, specific identity is unknown, except in one frog (*Rana temporaria*) and a few marine fishes, with one of fresh-water, the northern pike (*Esox lucius*). The numerous tortoises of North America remind one especially of Eastern Asia and India, but the western regions of our continent are as deficient in this form of animal life as the corresponding part of the Palaearctic region. *Chelydra* is peculiarly North American, and the *Cinosternidae* are Mexican in character.

The principal Crocodilian is our alligator, which presents only minor differences from the South American caimans. The lizards are all of Neotropical families, except the scines (*Eumeces*), which are found elsewhere chiefly in Africa and Australia. The genera are nearly all peculiar, or extend a short distance into the northern parts of the Neotropical, Mexico, and the West Indies. Some families have, however, a correspondence with those of the Old World, as follows: The Nearctic—

Teiidae to Lacertidae;

Gerrhonotidae to Zonuridae;

Iguanidae to Agamidae.

The *Batrachia* present relations to the Europeo-Asiatic fauna in the species of one genus (*Rana*) of frogs, and one genus (*Notophthalmus*) of salamanders. In other respects, the Nearctic batrachian fauna is highly peculiar. The cosmopolitan genus *Hyla* (tree-frogs) exists in numerous species, several of which are terrestrial. The burrowing-frogs (*Scaphiopidae*) are nearly all peculiar to this fauna. The toads are of a peculiar division of the all but cosmopolitan genus *Bufo*. The salamanders present the greatest peculiarities. The large family of *Plethodontidae* is represented by various forms, mostly terrestrial; while the genera *Desmognathus* and *Amblystoma*, each alone in its family, present curious structural modifications. To the latter belong the Sire-dons, or larval *Amblystomae*, which reproduce without regard to their metamorphosis, sometimes completing it and sometimes remaining unchanged.

As permanent gill-bearing *Batrachia*, *Necturus* represents the Palaearctic *Proteus*, and Siren is quite peculiar to North America. The *Amphiuma*, or snakelike *Batrachia*, calls to mind the similar extinct forms of the Coal-Measures; while *Protonopsis* is represented by living species in Eastern Asia, and by a fossil genus in the Miocene of Germany.

The marine fishes embrace some species which range both coasts of the North Atlantic. Such are the salmon, the haddock, the mackerel, etc., which furnish food and occupation for a numerous population on the northeastern coast. Farther south, the mullet (*Mugil albula*) is a valued food-fish, and is caught and packed in great numbers. The fishes of the Pacific coast are mostly distinct from those of the Atlantic, except a few circumpolar forms, as *Gasterosteus aculeatus*; but several (as *Gadus vachua*, Pall.) are found also on the Asiatic coast. On the warmer coasts, a few species are common to both oceans, while others exist which have a great range over several seas, noticeable among which are certain species of *Plectognathi*, particularly of *Diodon*, *Balistes*, etc.

The fresh-water fishes embrace many families characteristic of the northern hemisphere, as the cods (*Gadidae*), *Percidae* or perch, the sculpins (*Cottidae*), pike (*Esocidae*), chubs (*Cyprinidae*), the salmon, and herring, eel, sturgeon, and lamprey families. In the catfishes, the region reminds us of the tropical and southern regions; though it is a singular fact that one of our genera (*Amiurus*) is represented by single species in China.

The suckers (*Catostomidae*) are very abundant and characteristic in all fresh waters; but here, again, a single species (*Carpiodes sinensis*) has been detected in China. This is paralleled by the genus *Polyodon* (paddle-fish), of which one species is found in the Mississippi Valley, and one in the Yang-tse-kiang. The most striking peculiarity of the Nearctic waters is the presence of the family of *Lepidosteidae*, or bony gars, which is represented by two genera and numerous species. No form at all resembling these exists in any other country, excepting again one species in China, and one other which is found in the adjoining Neotropical region. Not less peculiar are the species of dog-fish (*Amia*), type of the order *Halecomorphi*, which have some remote affinities with South American forms.

The relations to the Neotropical realm are in part indicated in the table on page 57. But few species are common to the Nearctic and

Southern Neotropical realms. But one mammal (the cougar, *Felis concolor*), and no reptiles, batrachians, nor fresh-water fishes, extend into Brazil; but a number of birds are permanent residents throughout both realms. These are mostly waders, as follows:

Rallus crepitans.

Limosa fedoa.

Tryngites rufescens.

Actiturus bartramius.

Heteroscelus brevipes.

Symphemia semipalmata.

Ereunetes petrificatus.

Aegialitis wilsonius.

Nyctherodius violaceus.

To these must be added the turkey-vulture, *Cathartes aura*. Then certain marine birds and a few fishes extend along the coasts of both regions, but their number is comparatively small.

The number of species of the Nearctic realm which occur in the Mexican region is rather greater. The red lynx and raccoon are examples of mammals, and several species of wood-warblers, vireos, and hawks represent the birds as far south as the Isthmus of Darien. The only reptiles are the snapping-tortoise and the ringed snake *Ophibolus dolia-tus*; the only batrachian is the *Rana halceina berlandieri*. A few other species, as *Eutaenia sirtalis*, extend for a shorter distance into the same region.

In the higher groups of the genus and family, we have greater community with the Neotropical realm. But few genera of *Batrachia* and *Reptilia* extend to its Brazilian region, but there are a few common genera of *Mammalia* (*Mephitis*, *Procyon*, *Ursus*, *Sciurus*, *Hesperomys*, and *Didelphys*), and a number of birds, especially among the lower orders, and the scansores, syndactyli, and clamatores, particularly the *Tyrannidae*. The number of genera which enter Mexico and Central America is much greater, and I select the following from the mammals, reptiles, and batrachians, as these are incapable of the migrations performed by birds. Cosmopolitan genera and those common to both the American realms are omitted.

MAMMALIA.

*Lynx.**Urocyon.**Putorius.**Bassaris.**Geomys.**Thomomys.**Ochetodon.**Arvicola.**Neotoma.**Sigmodon.**Cariacus.**Antilocapra.*

REPTILIA.

*Crotalus.**Candisona.**Aneistrodon.**Tropidoclonium.**Tropidonotus.**Eutaenia.**Trimorphodon.**Hypsiglena.**Ophibolus.**Phimothyrus.**Pityophis.**Coluber.**Tantilla.**Chilomeniscus.**Cinosternum.**Chelydra.**Pseudemys.**Chelopus.**Seeloporus.**Phrynosoma.**Heloderma.**Barissia.**Gerrhonotus.**Oligosoma.**Eumeces.**Cnemidophorus.*

BATRACHIA.

*Amblystoma.**Spelerpes.**Spea.**Rana.*

Of fishes, the common genera of the fresh waters are few. They are *Girardinus*, *Gambusia*, *Haplochilus*, and *Fundulus* of Cyprinodontidae, and *Atractosteus* of the bony gars. The southward distribution of the above genera terminates at various points; but those which belong to the Austroriparian region, as distinguished from the Sonoran, are mainly confined to the Mexican plateau. The presence of these, together with a number of peculiar forms, indicates another region of the Nearctic, which is in many respects allied to the Austroriparian. This subject will be considered in a subsequent paper.

In comparing the Nearctic realm with the West Indian region of the Neotropical, much less resemblance can be detected, especially in the Reptiles and Batrachia. The only identical species is the *Anolis principalis*, which is common to the Austroriparian region and Cuba, and there are three others of West Indian origin found in the southern part of Florida. The *Anolis* is the only reptilian genus of wide distribution in the Nearctic realm which occurs in the West Indian region. The West Indian genus *Dromicus* is represented by one species, a rare snake from the coast of North Carolina. In Batrachia, there is no community of species and none of genera, excepting in the case of the cosmopolitan genera *Bufo* and *Hyla*.

IV.—THE REGIONS.

We may now consider the variations exhibited by the component parts of the Nearctic fauna. The distribution of types indicates six principal subdivisions, which have been called the Austroriparian, Eastern, Central, Pacific, Sonoran, and Lower Californian. The Austroriparian region extends northward from the Gulf of Mexico to the isothermal of 77° F. It commences near Norfolk, Va., and occupies a belt along the coast, extending inland in North Carolina. It passes south of the Georgia Mountains, and to the northwestward up the Mississippi Valley to the southern part of Illinois. West of the Mississippi, the boundary extends south along the southern boundary of the high lands of Texas, reaching the Gulf at the mouth of the Rio Grande.

The Eastern is the most extended, reaching from the isothermal line of 77° F. north and from the Atlantic Ocean to the elevated plains west of the Mississippi River. Many of its forms extend up the bottoms of the rivers which flow to the eastward through "The Plains." The Central region extends from the limit of the Eastern as far west as the Sierra Nevada, and south on the mountains of Nevada, and along the mountains of New Mexico. The Sonoran includes parts of Nevada, New Mexico, Arizona, and Sonora in Mexico. It does not cross the Sierra Nevada, nor the Mojave desert, nor extend into the peninsula of Lower California. It sends a belt northward on the east side of the Sierra Nevada as far as, including Owen's Valley in Eastern California, latitude 37°, and enters other valleys in Nevada in the same way. It occupies the lower valley of the Rio Grande, and extends into Texas as far as the desert east of the Rio Pecos. It extends southward in Western Mexico as far as Mazatlan. The Lower Californian region occupies the peninsula of that name as far north as near San Diego.

The peculiarities of these regions are well marked. The two regions included in Eastern North America differ from all the others in the abundance of their turtles and the small number of their lizards. Prolific of life, this area is not subdivided by any marked natural barriers. Hence, though its species present great varieties in extent of range, it is not divided into districts which are very sharply defined. The warmer regions are much richer in birds, reptiles, and insects than the cooler; and as we advance northward many species disappear, while a few others are added. The natural division of the eastern part of the continent is then in a measure dependent on the isothermal lines which traverse it. In accordance with this view, the following districts have been proposed, viz: The Carolinian; the Alleghanian; the Canadian; and the Hudsonian.

The *Austroriparian region* includes the Floridan, Louisianian, and Texan districts. It possesses many peculiar genera of reptiles not found elsewhere, while the region north of it possesses none, its genera being distributed over some or all of the remaining regions. The number of peculiar species in all departments of animal life is large. It presents the greatest development of the eastern reptile life. Sixteen genera of Reptiles and eight of Batrachia do not range to the northward, while ninety-nine species are restricted in the same manner. The peculiar genera which occur over most of its area are—

LIZARDS.

*Anolis.**Oligosoma.*

SNAKES.

*Haldea.**Cemophora.**Tantilla.**Spilotes.**Abastor.**Farancia.*

TORTOISES.

Macrochelys.

CROCODILES.

Alligator.

BATRACHIA.

*Engystoma.**Manculus.**Stereochilus.**Muraenopsis.**Siren.*

I have omitted from this list ten genera which are restricted to one or the other of its subdivisions. The *Siren*, the *Cemophora*, the *Anolis* (chameleon), and the *Alligator*, are the most striking of the above characteristic genera. No genus of lizards is peculiar excepting *Anolis* and *Oligosoma*, which have their greatest development in other than the Nearctic continent. Among serpents, a few genera of Neotropical character extend eastward along the region of the Mexican Gulf, as far as the Atlantic coast, which are not found in any of the Northern regions; such are *Spilotes*, *Tantilla* (occurs in Lower California), and *Elaps* (also in the Sonoran). On the other hand, *Celuta*, *Virginia*, *Haldea*, and *Storeria*, embrace small serpents which it shares with the Eastern region.

This region is the headquarters of the Batrachia, especially of the tailed forms. The majority of species of the tailless genera are found here, especially of *Hyla* (tree-toads), *Rana*, and *Chorophilus*.

There are no less than nine genera of birds which do not, or only accidentally, range northward of this district. They are—

Plotus.

Tantalus.

Platalea.

Elanus.

Ictinia.

Conurus.

Chamaepelia.

Campephilus.

Helmitherus.

All these genera, excepting the last, range into South America or farther.

Among mammals, but few species and one genus (*Sigmodon*) are confined to it. *Lepus aquaticus* and *L. palustris*, the cotton-rat, the Florida *Neotoma*, etc., and a few others, are restricted by it. The fish-fauna is very similar to that of the Eastern region, under which it will be considered.

The *Eastern region* differs from the *Austroriparian* almost entirely in what it lacks, and agrees with it in all those peculiarities by which it is so widely separated from the *Central region*. No genus of mammals is found in it which does not range into the *Central* or other region, excepting *Condylura* (star-nosed mole); but numerous species are confined to it, not extending into the *Austroriparian*. These number from twenty to twenty-five. Among birds, the following genera are shared with the more southern region only: *Quiscalus*, *Seiurus*, *Oporornis*, *Helmitherus*, *Protonotaria*, *Parula*, *Mniotilta*, *Ortyx*. No genus of Reptiles, and but one of Batrachians (*Gyrinophilus*), is confined to this region; but it shares all it possesses with the *Austroriparian*. It has but three genera of lizards, viz, *Cnemidophorus*, *Eumeces*, and *Sceloporus*, which are universally Nearetic. The Batrachian genera not found in the *Central* are—

Scaphiopus.

Gyrinophilus.

Spelerpes.

Plethodon.

Hemidactylium.

Desmatognathus.

Menopoma.

Necturus.

The characteristics of the fish-fauna of Eastern Nearctica are much more marked; two entire orders, represented by the gar (*Ginglymodi*) and dog-fish (*Halecomorphi*), are confined to it, and a series of genera of *Percidae*, embracing many species, known as *Etheostominae*, have the same range. The *Siluridae* all belong here, as well as a great majority of the genera of *Cyprinidae* and *Catostomidae*. In all of these divisions, the region is very rich in species, owing to the abundance of everflowing rivers and streams which drain it. The *Polyodontidae* (spoon-bill or paddle-fish) are not found in any of the other regions.*

The *Central* region is characterized by the general absence of forests, as compared with the Eastern. It presents two distinct divisions, each peculiar in its vegetation: the division of the plains, which extends from the eastern border to the Rocky Mountains; and the Rocky Mountain region itself, which extends to the Sierra Nevada. The former is covered with grass, and is almost totally treeless; the latter is covered with "sage-brush" (*Artemisia*), a short stout bush, which forms extensive areas of treeless brush. The grass-covered plains are the range of the bison, though it formerly sought also the tracts of grass occasionally found among the *Artemisia*. The region, as a whole, is distinguished from the Eastern by the possession of several genera of ruminating Artiodactyles, *i. e.*, *Antilocapra*, *Haplocerus*, and *Ovis*, as well as certain species of the same group, *i. e.*, *Caracus macrotis* (black-tailed deer) and *C. leucurus*. Other genera of mammals which distinguish it from the Eastern are *Taxidea*, *Cynomys*, *Spermophilus*, *Dipodomys*, *Perognathus*, and *Lagomys*. A few species of *Spermophilus* extend into the northwestern portion of the Eastern; while the extensive genus *Geomys* (the subterranean gophers) range over the Central subregion, and into the Western and Gulf States the Austroriparian as far as the Savannah River. A great many species of birds are peculiar to the Central region, and the following genera:

Oroscoptes.

Hydrobata.

Myiadestes.

Neocorys.

Salpinctes.

Picicorvus.

Chondestes.

Calamospiza.

Embernagra.

Centrocerus.

Pediocetes.

* Excepting the course of the Mississippi, and perhaps the Rio Grande.

The game-birds of the Central region are larger than those of the Eastern. Such are the sage-cock, *Centrocercus urophasianus*; the *Pediocetes phasianellus*, or cock of the plains; the *Tetrao obscurus*; several ptarmigan (*Lagopus*); and *Bonasa*; the last three Palearctic genera also.

The reptiles are not numerous, and tortoises are especially rare. Besides the genera of lizards characteristic of the Eastern district, it adds *Phrynosoma*, *Crotaphytus*, and *Holbrookia*. Among snakes, no genus is peculiar, and the moccasins and *Elaps* are wanting. There is but one, possibly two, species of rattlesnake. Batrachians are few; most of the genera of *Anura* are found, except *Hyla*. Among salamanders, the only genus is *Amblystoma*; but this is abundant, its large larvae developing in the temporary pools of many arid regions. The burrowing-frog, *Spea bombifrons*, ranges the same region, and breeds in much the same way. No genus of Batrachians or Reptiles is peculiar to the Central region.

Fishes are few in families and species, largely in consequence of the poverty of the region in rivers and streams. In the Western Colorado and the Humboldt, perch, pike, Siluridae, herring, cod, eels, gar, dog-fish, and sturgeon are entirely wanting. *Cyprinidae*, *Catostomidae*, *Salmonidae*, and *Cottidae* are the only families abundant in individuals and species. The same remarks apply in great part to the Columbia River, where, however, the *Salmonidae* have a great development. These salmon are principally marine species, which ascend the river to deposit their spawn. They belong to many species, all peculiar to the region, and embrace incredible numbers of individuals.

The *Pacific* region is nearly related to the Central, and, as it consists of only the narrow district west of the Sierra Nevada, might be regarded as a subdivision of it. It, however, lacks the mammalian genera *Bos* and *Antilocapra*, and possesses certain peculiar genera of birds, as *Geococcyx* (ground-cuckoo or chaparral-cock), *Chamaea*, and *Oreortyx* (mountain-partridge). Of marine mammalia, there are several peculiar types, as the eared seals (*Otariidae*) and sea-otter (*Enhydra*). There are some genera of reptiles, *e. g.*, *Charina*, related to the Boas, *Lodia*, *Aniella*, *Gerrhonotus*, and *Xantusia*, which do not occur in the Central subregion. There are three characteristic genera of *Batrachia*, all salamanders, *viz.* *Anaides*, *Batrachoseps*, and *Dicamptodon*; while the Eastern genera *Plethodon* and *Diemyctylus* re-appear after skipping the entire Central district. The other types of Eastern *Anura* are found here, there being two species of *Hyla*.

A single species of tortoise (*Chelopus marmoratus*) exists in the Pacific region.

The fresh-water fish-fauna is much like that of the Central district in being poor in types. It adds the viviparous *Pharyngognathi* of the family of *Embiotocidae*, which is represented by a number of species. The marine fauna differs from that of the east coast in the great number of species of *Salmo* and *Sebastes* and the variety of types of *Cottidae*. In its northern regions, the genus *Chirus* and allies have their peculiar habitat. The singular genus *Blepsias* (related to *Cottus*) exists on the same coast, and several valuable species of cods (*Gadus auratus*, *G. periscopus*, and *Brachygadus minutus*), with the peculiar form *Bathymaster*, belong especially to the northern coasts.

The *Sonoran* region is strongly marked among the faunae already described. It is deficient in the species of ruminating Mammalia found in the Central, and possesses a smaller number of species of mammals than any of the others. Of birds, a few genera and several species are different from those of the Central; such are *Callipepla* (partridge), *Cichlopsis*, *Mitrephorus* (*Tyrannidae*), *Campylorhynchus*, and *Geococcyx*. Most of these genera occur in Mexico, and the last-named in California also. It is in Reptiles that the great peculiarity of this region appears. The following genera are not found in any of the other regions described:

LIZARDS.

Heloderma.

Sauromalus.

Uma.

Coleonyx.

SERPENTS.

Gyalopium.

Chionactis.

Sonora.

Rhinochilus.

Chilopoma.

Eight other genera of Reptilia are peculiar to this fauna and that of the Lower Californian region, under which they are enumerated. *Heloderma*, *Coleonyx*, and allies of *Gyalopium* of the above list are more largely developed in species and individuals in the Mexican region of the Neotropical realm. Every one of the five genera of serpents of the Sonoran

region is characterized by a peculiar structure of the rostral plate, which is produced either anteriorly or laterally to an unusual degree; two of the genera (*Phimothyr*a and *Chilomeniscus*), common to the Lower Californian region, present the same peculiarity.

This region is the headquarters of the rattlesnakes, there being no less than nine species found in it, of which six are peculiar. It also possesses a majority of the species of horned toads (*Phrynosoma*); only four of the North American species being unknown there. The Testudinate fauna is very poor, possessing a few species of Nearctic character, and three *Cinosterna*, two of them of Mexican type.

The Batrachian fauna exhibits but one genus of *Urodela*, but several of the *Anura*. Appropriately to its arid character, there is but one *Rana*, but six species of toad (*Bufo*), this being the headquarters of that genus in the Regnum Nearcticum. The eastern genus *Scaphiopus* appears here, instead of the *Spea* of the other western regions. There is one species of tree-frog.

Two species of turtles of the *Cinosternidae* have been found. The fresh-water fish-fauna is very poor, and but little known. In the Colorado River proper, the *Salmonidae* and *Cottidae* appear to be wanting, leaving only *Cyprinidae* and *Catostomidae*. A strongly-marked division of the former, the *Plagopterinae*, which embraces three genera, is mainly restricted to the Colorado River drainage, and is the most striking feature of the fish-fauna of the Sonoran region.

The *Lower Californian* region much more nearly resembles the Sonoran than the *Pacific* region. It possesses, however, many peculiar species of birds and reptiles. Snakes appear to be wanting, but other lizards abound. The following genera of reptiles have been found here, which do not occur in any other region of Nearctica:

LIZARDS.

Verticaria.
Diplodactylus.
Cyclura.

SNAKES.

Lichanura.

These, except the last, have been found in Mexico or South America. It shares with the Sonoran only, the following:

LIZARDS.

*Dipsosaurus.**Callisaurus.**Uta.**Phyllodactylus.*

SNAKES.

*Trimorphodon.**Hypsiglena.**Phimothya.**Chilomeniscus.*

These genera constitute the most characteristic feature of the two faunae, not occurring in any other part of North America. *Trimorphodon*, *Hypsiglena*, and *Phyllodactylus* are well represented in Mexico.

Of Batrachians we have, like the Sonoran, *Hyla*, *Scaphiopus*, and *Bufo*, but, on the other hand, *Plethodon*, as in the Pacific and Eastern. Of the fresh-water fish-fauna, nothing is known; the streams are few and small. This region extends northward to the southern boundary of California.

Among the Invertebrata, the *Mollusca* present facts of distribution similar in significance to those derived from the study of the *Vertebrata*. Thus the Eastern, the Middle, and the Pacific districts are plainly marked out in the fresh-water and land Mollusca. To the former are entirely confined the *Streptopomatidae* and the great majority of the *Unionidae*, which together constitute more than two-thirds the species of the Nearctic realm. Of land-shells, the great series of toothed snails (*Mesodontinae*), which embraces many genera and species, is almost confined to the Eastern subregion. The same is true of the snails of the group of *Gastrodontinae* and of the genera *Hyalina* and *Hygromia*. The Central subregion is characterized by its poverty in all that respects Mollusca, while several genera of land-snails are peculiar to the Pacific region, and are largely represented by species there. One hundred of the four hundred land-shells described from the Regnum Nearcticum belong to the western coast. Among snails, the genera *Aglaja*, *Arionta*, and *Polymita* are represented by handsome species. *Macrocyclus* and *Binnena* belong especially to this region.

As is to be supposed, the *Insects* indicate a greater number of subdivisions than the other animals. The fresh-water *Crustacea* have been but sparingly studied. They seem, however, to have a wide distribution; thus *Cambarus* (craw-fish) and *Artemia* are found everywhere where physical conditions are suitable.

V.—THE AUSTRORIPARIAN REGION.

V^a. Reptiles whose distribution corresponds with the area of the Austroriparian region—24 :

Trachystomata.

Siren lacertina.

Anura.

Engystoma carolinense.

Acris gryllus gryllus.

Hyla squirella.

Hyla carolinensis.

Ophidia.

Candisona miliaria.

Ancistrodon piscivorus.

Elaps fulvius.

Haldea striatula.

Farancia abacura.

Cemophora coccinea.

Ophibolus doliatus coccineus.

Coluber obsoletus confinis.

Coluber guttatus.

Tropidonotus fasciatus.

Lacertilia.

Oligosoma laterale.

Cnemidophorus sexlineatus sexlineatus.

Opheosaurus ventralis.

Anolis principalis.

Testudinata.

Macrochelys lacertina (except Atlantic slope).

Pseudemys mobiliensis (except Atlantic slope).

Pseudemys concinna.

Testudo carolina.

Crocodilia.

Alligator mississippiensis.

As already remarked, this fauna is composed of the Floridan, Louisianian, and Texan districts.

The *Floridan* district contains either peculiar species of animals, or those of West Indian or South American character. The characteristic birds are chiefly of the latter character, but among reptiles the following are confined to it:

V^b. Species confined to the Floridan district of the above—18:

Urodela.

Manculus remifer.

Anura.

Hyla gratiosa.

Lithodytes ricordii (Cuba ; Bahamas).

Rana areolata capito.

Ophidia.

Elaps distans (Sonoran also).

Contia pygaea.

Eutaenia sackenii.

Tropidonotus compsolaemus.

Tropidonotus compressicaudus.

Tropidonotus ustus.

Tropidonotus cyclopium.

Helicops allenii.

Lacertilia.

Rhineura floridana.

Eumeces egregius.

Eumeces onocrepis.

Sceloporus floridanus.

Sphaerodactylus notatus (Cuba).

Crocodylia.

Crocodylus americanus (Cuba).

Of the above, the species of *Crocodylus*, *Sphaerodactylus*, and *Lithodytes* only, have been found in the Antilles. The genera of the above list which are peculiar to the Floridan district of the Nearctic fauna are—

Lithodytes.

Helicops.

Rhineura.

Sphaerodactylus.

A venomous snake, the *Elaps distans*, is common to this district and the Sonoran fauna.

Some small mammals are confined to this region also. The genera of birds that do not range north of it are—

| | |
|-------------------------|-------------|
| <i>Certhiola</i> . | |
| <i>Zenaida</i> | } Pigeons. |
| <i>Oreopelia</i> | |
| <i>Sternaenas</i> | |
| <i>Rostrhamus</i> | } Raptores. |
| <i>Polyborus</i> | |
| <i>Aramus</i> | } Waders. |
| <i>Audubonia</i> | |
| <i>Phoenicopterus</i> . | |
| <i>Haliplana</i> | } Terns. |
| <i>Anoüs</i> | |

The *Louisianian* district possesses the peculiarities of the austroriparian fauna already pointed out, minus those of Florida and Texas. Of *Mammalia*, the genera *Alces*, *Mustela*, *Jaculus*, *Arctomys*, *Fiber*, and *Condylura* are wanting, as well as the red-squirrel, Canada lynx, gray-rabbit, etc. Its most remarkable birds are the nonpareil finch, ivory-billed woodpecker, parrakeet, etc., while its *Elaps fulvius*, or coral-snake, is one of the most beautiful of the order. A large and dangerous rattlesnake is also confined to it, viz, *Caudisona adamantea*, and the well-known moccasin *Ancistrodon piscivorus* does not range outside of its boundaries. A species of the West Indian *Dromicus* (serpents) has been found on the Atlantic coast.

V^c. Species confined to the Louisianian district—36: (E confined to the Eastern portion; W to the Western, as far as known).

Trachystomata.

Pseudobranchius striatus. E.

Proteida.

Necturus punctatus. E.

Urodela.

Amphiuma means.

Muraenopsis tridaetyla. W.

Amblystoma talpoidenum. E.

Amblystoma cingulatum. E.

Stereochilus marginatum. E.
Manculus quadridigitatus. E.
Spelerpes guttolineatus. E.

Anura.

Bufo lentiginosus lentiginosus.
Bufo quereicus.
Chorophilus nigratus.
Chorophilus angulatus.
Chorophilus oculatus.
Chorophilus ornatus.

Ophidia.

Crotalus adamanteus adamanteus.
Virginia harperti.
Virginia elegans. W.
Tantilla coronata.
Abastor erythrogrammus.
Osceola elapsoidea. E.
Ophibolus rhombomaculatus.
Coluber quadrivittatus. E. .
Spilotes couperii. E.
Bascanium flagelliforme flagelliforme. E.
Bascanium anthicum. W.
Tropidonotus taxispilotus.
Heterodon simus simus. .

Testudinata.

Aspidonectes asper. W.
Aspidonectes ferox.
Aromochelys carinatus.
Pseudemys hieroglyphica. (?)
Pseudemys scabra.
Chrysemys reticulata.
Cistudo clausa triunguis. (Penna.)

A number of the genera of the above catalogue are not yet known to extend their range into the Floridan or Texan districts, as follows :

Pseudobranchus.
Muraenopsis.
Virginia.
Abastor.
Osceola.

The genus *Virginia* occurs within the State of Texas, but whether within the Texan district is not certain, as the line separating the latter from the Louisianian district is not well known. The *Spelerpes multiplicatus*, a rare salamander from Western Arkansas, is in the same way, of uncertain reference.

The species of the following list have a peculiar range, some of them (marked E) extending beyond the borders of the Austroriparian region

V^c. Species which range along the Mississippi Valley and not eastward of it—13:

Urodela.

Amblystoma microstomum (E.).

Ophidia.

Carphophiops helenae.

Virginia elegans.

Ophibolus calligaster (E.).

Coluber emoryi (E.).

Eutaenia faireyi (E.).

Eutaenia proxima.

Tropidonotus grahamii (E.).

Tropidonotus rhombifer.

Testudinata.

Macrochelys lacertina.

Pseudemys troostii.

Malacoclemmys geographica (E.).

Malacoclemmys psendogeographica (E.).

The *Texan* district of the *Austroriparian* region is not the range of any genus not found elsewhere, but possesses the peculiar genera of the Louisianian district, many of which are represented by corresponding and peculiar species. Seventeen such species of reptiles may be enumerated, besides a salamander and a toad. Several species of mammals are also peculiar to it, *i. e.*, five rodents and two skunks. Of birds, three appear to be, so far as known, peculiar, *Ortyx texanus*, *Vireo atricapillus*, and *Milvulus forficatus*. Many Mexican birds are found on the Rio Grande, while a few enter Texas to a greater distance, as *Icterus parisorum*. The high northwestern regions of the State should be assigned to the Sonoran fauna, as the range of the two partridges (*Callipepla squamata* and *Cyrtonyx massena*) and the finch (*Peucaea cassinii*).

Several genera of mammals, birds, and reptiles exist in the Texan region, which constitute its chief claim for distinction from the Louisianian; these are—

MAMMALS.

Dicotyles (Nt.).

Bassaris (P. Nt.).

BIRDS.

Geococcyx (P. S.).

REPTILES.

Holbrookia (C. S.).

Phrynosoma (C. S. P.).

Stenostoma (Nt. P.).

None of these are peculiar: those marked (P.) being also found in the Pacific; (C.) the Central; (S.) the Sonoran; and (Nt.) the Neotropical region. Two striking species of mammals range through the Texan district, viz, the jaguar and the peccary.

V^e. Species confined to the Texan district—21:

Caducibranchiata.

Amblystoma texanum.

Anura.

Bufo valliceps (also Mexico).

Chorophilus triseriatus clarkii.

Hyla carolinensis semifasciata.

Rana areolata areolata.

Ophidia.

Crotalus adamanteus atrox.

Ancistrodon piscivorus pugnax.

Elaps fulvius tener.

Tantilla gracilis.

Tantilla hallowellii.

Tantilla nigriceps.

Contia episcopa.

Ophibolus doliatus annulatus.

Diadophis punctatus stietogenys.

Coluber lindheimerii.

Eutaenia marciana (extends W.).
Tropidonotus clarkii.
Tropidonotus sipedon woodhousei.

Lacertilia.

Holbrookia texana.
Phrynosoma cornutum.

Testudinata.

Aspidonectes emoryi.

VI.—THE EASTERN REGION.

This fauna presents four districts, viz, the Carolinian; the Alleghenian; the Canadian; and the Hudsonian. These are distinguished by the ranges of mammals and reptiles, and the breeding-places of birds. The Carolinian fauna extends in a belt north of the Louisianian, and south of the isothermal of 71°. Its northern boundary is said to extend from Long Island, south of the hill-region of New Jersey, to the southeastern corner of Pennsylvania, and thence inland. It embraces a wide belt in Maryland and Virginia, and all of central North Carolina, and then narrows very much in passing round south of the Alleghenies of Georgia. It extends north again, occupying East Tennessee, West Virginia, Kentucky, Indiana, the greater parts of Illinois and Ohio, and the southern border of Michigan. It includes also Southern Wisconsin and Minnesota, all of Iowa, and the greater part of Missouri. The Alleghenian embraces the States north of the line just described, excepting the regions pertaining to the Canadian fauna, which I now describe. This includes Northern Maine, New Hampshire, and Vermont, with the Green Mountains; the Adirondacks and summits of the Alleghany Mountains as far as Georgia. It includes Canada East and north of the lakes. The Hudsonian fauna is entirely north of the isothermal of 50°. It has great extent west of Hudson's Bay, and is narrowed southeastward to Newfoundland.

VI^a. Species peculiar to the Eastern region—34:

Proteida.

Necturus lateralis.

Caducibranchiata.

Menopoma fuscum.
Amblystoma bicolor.

Amblystoma xiphius.
Amblystoma jeffersonianum.
Spelerpes ruber montanus.
Gyrinophilus porphyriticus.
Desmognathus ochrophaea.
Desmognathus fusca fusca.
Desmognathus nigra.

Anura.

Bufo americanus fowleri.
Chorophilus triseriatus corporalis.
Hyla pickeringii.
Rana palustris.
Rana temporaria silvatica.
Rana temporaria cantabrigensis
Rana septentrionalis (nearly).

Ophidia.

Candisoua tergemina.
Virginia valeriae.
Ophibolus doliatus triangulum.
Cyclophis vernalis (rare south).
Coluber vulpinus.
Pityophis sayi sayi.
Storeria occipitomaculata.
Eutaenia sirtalis ordinata.
Tropidoclonium kirtlandii.

Lacertilia.

Eumeces anthracinus.

Testudinata.

Aspidonectes spinifer.
Amyda mutica.
Pseudemys rugosa.
Chelopus guttatus.
Chelopus mühlenbergii.
Chelopus inaeulptus.
Emys meleagris.

The *Carolinian* fauna is not so marked among reptiles as among birds. One genus of the former, *Cnemidophorus* (swift lizard), does not range north of it, with the genera *Virginia*, *Cyclophis*, *Haldea*, and *Pityophis* among serpents. Species confined in their northern range by the same limit are—

Ophibolus doliatus doliatus.

Ophibolus getulus.

Tropidonotus sipedon erythrogaster.

Pseudemys rugosa.

Malacoclemmys palustris.

Hyla andersonii.

Genera of birds restricted in the same way are—

Guiraca.

Helmitherus.

Mimus.

Polioptila.

Gallinula.

Herodias.

Florida.

Himantopus.

Recurvirostra.

The *Alleghanian* district includes nearly all of the remaining species of Reptiles and several Batrachians. The genera of these which do not extend north of it are the following :

LIZARDS.

Sceloporus.

Eumeces.

SNAKES.

Carphophiops.

Coluber.

Cyclophis.

Tropidonotus.

Ophibolus.

Heterodon.

Caulisoma.

Crotalus.

Ancistrodon.

BATRACHIA.

*Chorophilus.**Hyla.**Hemidactylium.**Desmognathus.**Menopoma.**Necturus.*

The species thus restricted number twenty-six. The genera of birds which do not range north of this fauna are numerous. They are—

*Sialia.**Vireo.**Pyrrhula.**Harporhynchus.**Troglodytes.**Cyanospiza.**Pipilo.**Ammodramus.**Sturnella.**Icterus.**Zenaidura.**Cupidonia.**Ortyx.**Meleagris.**Ardea.**Rallus.*

The catamount, red-squirrel, jumping-mouse, gray-rabbit, star-nosed mole, and elk, do not range south of this fauna.

The *Canadian* fauna is distinguished for its few reptiles (there being only seven species) and Batrachia, as follows :

TORTOISES.

*Chelydra serpentina.**Chelopus insculptus.**Chrysemys picta.*

SNAKES.

*Bascanium constrictor.**Eutaenia sirtalis.**Diadophis punctatus.**Storeria occipitomaculata.*

FROGS.

*Rana temporaria cantabrigensis.**Rana septentrionalis.*

SALAMANDERS.

*Desmognathus ochrophaca.**Desmognathus nigra.**Spelerpes ruber.**Spelerpes bilineatus.*• *Spelerpes longicauda.*

This fauna extends south along the crests of the Alleghenies, where we find the catamount, snow-bird, red-squirrel, and brook-trout (*Salmo fontinalis*), and *Desmognathus ochrophaca*, as far as Georgia.

Several mammals are restricted in northward range by the boundary of this fauna; such are the buffalo, raccoon, skunk, wild-cat, panther, star-nosed mole, etc.; and the moose, caribou, wolverine, and fisher do not range, according to J. A. Allen, south of it.

VI^b. Species confined to the Canadian district, or nearly so :

*Urodela.**Amblystoma jeffersonianum laterale.**Anura.**Bufo lentiginosus fowleri.**Rana septentrionalis.**Rana temporaria cantabrigensis.*

In the *Hudsonian* district there are no reptiles, and the fresh waters begin to present various new species of *Salmo* and *Coregonus* (trout and white-fish). The catamount, fisher, ermine, black-bear, red-squirrel, ground-hog, etc., do not range north of it. The following singing-birds breed there :

*Anthus ludovicianus.**Saxicola oenanthe.**Ampelis garrula.**Aegiothus linaria.**Plectrophanes lapponica.**Plectrophanes nivalis.**Plectrophanes picta.**Leucosticte tephrocotis.*

The first and last two are the only species not also found in Europe. Numerous waders and swimming-birds breed in this region, the whole

number being thirty-six; while ninety-six species of birds do not wander north of it. To this category many of the common species of the Middle States belong.

North of this the species of vertebrates are circumpolar or arctic.

The ichthyological fauna of the two Eastern subregions remains to be considered. For the present, they will be united, though the distribution of fresh-water fishes is governed by laws similar to those controlling terrestrial vertebrates and other animals, in spite of the seemingly confined nature of their habitat. With this general principle in view, we may revert briefly to this distribution over this district of the Neartic region. This large area is characterized by the distribution of several species in all its waters, or nearly so, so far as yet examined—those of *Semotilus*, *Ceraticthys*, *Hypsilepis*, *Catostomus*, etc., or by the universal recurrence of the same in suitable situations; and by the representation of these and other genera by nearly allied species in its different portions. The fauna of the tributaries of the Mississippi constitutes, it might be said, that of our district; while the slight variations presented by the Atlantic-coast streams might be regarded as exceptional. The fauna of the great lakes combines the peculiarities of both, possessing as a special peculiarity, (I), which belongs to the Lake region, which, in the district, commences at latitude 42° and extends to the Arctic regions, the range of the genus *Coregonus*. The peculiarity of the Atlantic subdistrict (II) may be said to be the abundance of *Esox*, *Salmo*, and *Anguilla*, and the absence of *Haploidonotus*. The first two are abundant in the Lake region, while *Anguilla* and *Haploidonotus* have but a partial distribution there. In (III), the Mississippi basin, *Esox* is represented by but few species, and remarkably few individuals. *Salmo* occurs abundantly in the upper parts of the Missouri tributaries, exists in the western mountain-streams of the Alleghanies, becoming rare in those of the Kanawha, and only occurring near the highest summits in those of the Tennessee, south to the line of South Carolina. It is especially characterized by the paddle-fish (*Spatularia* or *Polyodon*), the shovel-sturgeon (*Scaphirhynchops*), and the alligator-gar (*Atractosteus*); also by the buffalo (*Bubalichthys*), the *Cycleptus*, etc., among suckers, and the fork-tailed catfish (*Ichthaelurus*). Among Percomorphs, the *Haploidonotus* is the characteristic genus; and among those allied to the herring, the genus *Hyodon*. Numerous species are confined to its affluents. The gradation from the Mississippi grouping of species to the Atlantic is very gradual, and takes place in successional order from

those emptying into the Gulf of Mexico toward the east and northeast, until we reach the rivers of Massachusetts and Maine, where the greatest modification of the fauna exists. The latter fact has been pointed out by Agassiz, who calls this region a "zoölogical island," and enumerates the characteristic Nearctic genera which are wanting there. I give now a list showing the points at which Mississippi genera cease, as we follow the rivers of the Gulf and Atlantic coasts, so far as our present knowledge extends.

Gulf rivers: *Haploidonotus* has not yet been indicated from eastward of these, except in the Lake area.

Roanoke: *Campostoma* ceases here.

James: *Micropterus* and *Ambloplites* cease.

Potomac: *Pomoxys*, according to Professor Baird (verb. commn.), ceases here.

Susquehanna: *Ceratichthys*, *Eroglossum*, *Chrosomus*, *Carpodes*, cease.

Delaware: *Clinostomus*, *Hypsilepis analostanus*, *Enneacanthus*, and *Lepidosteus* cease.

Hudson: *Semotilus corporalis*, according to F. W. Putnam (verb. commn.), ceases.

The types remaining in the Atlantic waters of the New England district (IV) are first, then, *Salmo*, *Esox*, *Anguilla*, *Perca*; and, secondly, the general types *Boleosoma*. *Semotilus*, *Hypsilepis*, *Stilbe*, *Hybopsis* (*bifrenatus*), *Fundulus*, and *Amiurus*; and the Lake types *Lota* and *Coregonus*

VII.—THE CENTRAL REGION.

VII^a. Species peculiar to the Central region—12:

Anura.

Spea bombifrons.

Ophidia.

Ophibolus multistratus.

Eutaenia radix.

Eutaenia vagrans vagrans.

Eutaenia sirtalis parietalis.

Lacertilia.

Eumeces septentrionalis.

Eumeces inornatus.

Eumeces multivirgatus.

Holbrookia maculata maculata.

Phrynosoma douglassii douglassii.

Testudinata.

Pseudemys elegans.
Chrysemys oregonensis.
Cistudo ornata.

VIII.—THE PACIFIC REGION.

VIII^a. Species confined to the Pacific region—44:

Urodela.

Amblystoma macrodactylum.
Amblystoma parotikum.
Amblystoma tenebrosum.
Amblystoma aterrimum.
Dicamptodon ensatus.
Batrachoseps attenuatus.
Batrachoseps nigriventris.
Batrachoseps pacificus.
Plethodon intermedius.
Plethodon oregonensis.
Anaides lugubris.
Anaides ferreus.
Diemyctylus torosus.

Anura.

Bufo halophilus.
Hyla regilla.
Hyla cadaverina.
Spea hammondi.
Rana temporaria aurora.
Rana pretiosa.

Ophidia.

Crotalus lucifer.
Contia mitis.
Lodia tenuis.
Pityophis catenifer.
Bascanium constrictor vetustum.
Eutaenia hammondi.
Eutaenia elegans.
Eutaenia sirtalis pickeringii.

Entaenia sirtalis concinna.
Entaenia sirtalis tetrataenia.
Entaenia cooperii.
Entaenia atrata.
Charina plumbea.
Stenostoma humile.

Lacertilia.

Aniella pulchra.
Eumeces skiltonianus.
Xantusia vigilis.
Barissia olivacea.
Gerrhonotus principis.
Gerrhonotus grandis.
Gerrhonotus scincicaudus.
Uta graciosa.
Uta schottii.
Phrynosoma blainvillei.

Testudinata.

Chelopus marmoratus.

Gerrhonotus multicarinatus is common to the Pacific and Lower California regions.

IX.—THE SONORAN REGION.

IX^a. Species confined to the Sonoran region—68 :

Anura.

Bufo alvarius.
Bufo debilis.
Bufo microscaphus.
Bufo speciosus.
Bufo lentiginosus frontosus.
Hyla eximia. (Mexico also.)
Hyla arenicolor.
Scaphiopus varius rectifrenis.
Scaphiopus conchii.

Ophidia.

Crotalus pyrrhus.
Crotalus cerastes.
Crotalus tigris.

Crotalus adamanteus scutulatus.
Crotalus molossus.
Caudisona edwardsii.
Elaps euryxanthus.
Chilomeniscus ephippicus.
Chilomeniscus cinctus.
Chionactis occipitalis.
Contia isozona.
Sonora semiamulata.
Gyalopium canum.
Rhinochilus lecontei.
Ophibolus pyrrhomelus.
Ophibolus getulus splendidus.
Diadophis regalis.
Hypsiglena ochrorhyncha chlorophaea.
Phimothyrus grahamiae.
Bascanium flagelliforme piceum.
Chilopoma rutipunctatum.
Eutaenia macrostemma.
Eutaenia vagrans angustirostris.
Tropidonotus validus validus.
Tropidonotus sipedon conchii.
Stenostoma dulce.

Lacertilia.

Eumeces obsoletus.
Eumeces guttulatus.
Cnemidophorus grahamii.
Cnemidophorus inornatus.
Cnemidophorus octolineatus.
Cnemidophorus tessellatus gracilis.
Cnemidophorus tessellatus melanostethus.
Gerrhonotus nobilis.
Gerrhonotus infernalis.
Heloderma suspectum.
Callisaurus draconoides ventralis.
Uma notata.
Sauromalus ater.
Crotaphytus reticulatus.
Uta ornata.

Sceloporus ornatus.
Sceloporus jarrovii.
Sceloporus poinsettii.
Sceloporus torquatus.
Sceloporus conchii.
Sceloporus marmoratus.
Sceloporus clarkii.
Phrynosoma modestum.
Phrynosoma maclellanii.
Phrynosoma regale.
Phrynosoma planiceps.
Phrynosoma hernandezii.
Coleonyx variegatus.
Phyllodaetylus tuberculatus.

Testudinata.

Cinosternum sonoriense.
Cinosternum henrici.
Cinosternum flavescens.
Testudo agassizii.

Phrynosoma platyrhinum has as yet been observed in Nevada only.

X.—THE LOWER CALIFORNIAN REGION.

X^a. Species peculiar to the Lower Californian region—27 :

Urodela.

Plethodon croceater.

Anura.

Hyla curta.

Ophidia.

Crotalus enyo.
Crotalus mitchellii.
Tantilla planiceps.
Chilomeniscus stramineus.
Ophibolus californiae.
Ophibolus getulus conjunctus.
Hypsiglena ochrorhyncha ochrorhyncha.
Phimothyra decurtata.
Pityophis vertebralis.
Bascanium aurigulum.

Tropidonotus validus celaeno.
Charina bottae.
Lichanura trivirgata.
Lichanura myriolepis.
Lichanura roseofusca.

Lacertilia.

Phyllodactylus unctus.
Phyllodactylus xanti.
Cnemidophorus maximus.
Verticaria hyperythra.
Callisaurus draconoides.
Uta thalassina.
Uta nigricauda.
Sceloporus clarkii zosteromus.
Phrynosoma coronatum.
Cyclura hemilopha.

XI.—RELATION OF DISTRIBUTION TO PHYSICAL CAUSES.

The first observation with regard to the Batrachian and Reptilian fauna of North America is the usual one, viz, that the number of specific and generic types exhibits a rapid increase as we approach the tropics. Of the area inhabited by these forms of animals, less than one-fourth is included in the three Southern regions—the Austroriparian, the Sonoran, and the Lower Californian; yet these contain more than half of the entire number of species, and all but eight of the genera are found in them. Of this number, forty-two genera, or one-third of the total, is confined to within their boundaries. It is a truism directly resulting from the very small production of animal heat by these animals, that temperature, and therefore latitude, has the greatest influence on their life and distribution. This is exhibited in other ways than in multiplication of forms. It is well known, that although plainly-colored reptiles are not wanting in the tropics, brilliantly-colored species are much more abundant there than in temperate regions. Although the Regnum Nearcticum does not extend into the tropics, its southern districts are the habitat of most of the species characterized by bright colors. This is most instructively seen in species having a wide range. Such is the case with the southern subspecies of *Desmognathus* among salamanders, and *Hyla* among frogs. So with snakes of the genera *Crotalus*, *Caudisoma*, *Ophibolus*, *Buscanium*, and *Eutaenia*. It is

also true of the lizards of the genera *Phrynosoma*, *Holbrookia*, and *Sceloporus*. *Eutania* and *Sceloporus* become metallic in the Mexican sub-region, as is also the case with the Anoles. The North American species of *Anolis* does not display metallic luster, while a large part of those of Mexico and a smaller proportion of those of the West Indies exhibit it.

Another important influence in the modification of the life in question is the amount of terrestrial and atmospheric moisture. In the case of the Batrachia, this agent is as important as that of heat, since a greater or less part of their life is, in most species, necessarily spent in the water. The reptiles are less dependent on it, but, as their food consists largely of insects, and as these in turn depend on vegetation for sustenance, the modifying influence of moisture on their habits must be very great.

The Central region combines the disadvantages of low temperature, due to its elevation above the level of the sea, and of arid atmosphere: hence its poverty in *Batrachia* and *Reptilia*. There are but nine species of both classes peculiar to it, while a few others enter from surrounding areas.

The distribution in the other regions is evidently dependent on the same conditions. Thus the well-watered, forest-covered Eastern and Austroriparian regions are the home of the salamanders, the frogs, the tree-toads, and the turtles. The dry and often barren Sonoran and Central regions abound in the lizards and the toads. The Pacific region, which is intermediate in climatic character, exhibits a combination of the two types of life; it unites an abundant lizard-fauna with numerous frogs and salamanders, while there is but one tortoise.

Another character of the reptilian life of arid regions is to be seen in a peculiarity of coloration. This, which has been already observed by the ornithologists, consists of a pallor, or arenaceous hue of the body, nearly corresponding with the tints of dry or sandy earth. This prevails throughout the Batrachia and Reptilia of the Sonoran region, although it is often relieved by markings of brilliant color, of which red is much the most usual. This peculiarity doubtless results immediately from the power of metachrosis, or color-change, possessed by all cold-blooded Vertebrata, by means of which they readily assume the color of the body on which they rest. That a prevalent color of such bodies should lead to a habit of preference for that color is necessary, and as such habits become automatic, the permanence of the color is naturally established.

Another peculiarity of the Sonoran region, and which it shares with a part of Mexico, is the predominance of snakes which possess an extraordinary development of the rostral shield either forward or outward. This has also been observed by Professor Jan, who referred such genera to a group he termed the *Probletorhinidae*, but which has not sufficient definition to be retained in the system. Of ten genera of snakes in the Nearetic region which possess the character, nine are found in the Sonoran subregion, five are peculiar to it, and it shares two with the Lower Californian subregion only. One of the latter (*Phimothya*) is closely imitated by a genus (*Lytorhynchus*) which occurs on the borders of the African Sahara. The *Heterodon* of the Eastern States, though not confined to the sandy coast-regions, greatly abounds there; and the South American species skip the forest-covered Amazon Valley and reappear on the plains of the Paraguay and Parana. As the Sonoran region embraces a number of desert areas, it is altogether probable that the peculiar forms in question have a direct relation to the removing of dry earth and sand, in the search for concealment and food. A modification of foot-structure, supposed to have relation to the same end, is seen in the movable spines on the outer side of the foot in the genus *Uma*, a character exhibited in higher perfection in the South African genus *Ptenopus*. *

The abundance of Bufones is doubtless due in part to their adaptation to life in dry regions. They are mostly furnished with tarsal bones especially developed for excavating purposes.

* Proc. Acad. Phila., 1868, p. 321.

PART IV.

BIBLIOGRAPHY.

The present list only includes the titles of works and memoirs which embrace discussions of systematic or distributional relations of the reptiles of the Regio Neartica. Those embracing descriptions of species only will be added at a future time.

The subject of general geographical distribution has been especially investigated by Slater, Huxley, and the writer; while Baird, Agassiz, LeConte, Verrill, Allen, and the writer have devoted themselves especially to the distribution of the animals of the fauna Neartica. In 1856, Dr. Hallowell remarked the rarity of salamanders and turtles in the Sonoran region,* and Professor Baird has especially demonstrated the complementary relation exhibited in the distribution of lizards and turtles in North America. Professor Verrill and J. A. Allen have defined the faunal subdivisions of Eastern North America with great success, basing their conclusions on the distribution of birds and *Mammalia*. The writer subsequently defined the Sonoran and Lower Californian regions, and elevated the Austroriparian area to the same value, adopting, also, the districts of Verrill and Allen. In the present essay I am greatly indebted to the learned work of J. A. Allen for information on the distribution of birds, as well as to the previous essay of Professor Baird on the birds and mammals.

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Department of the Interior:

U. S. NATIONAL MUSEUM.

— 4 —

BULLETIN

OF THE

UNITED STATES NATIONAL MUSEUM.

No. 4.

PUBLISHED UNDER THE DIRECTION OF THE SMITHSONIAN INSTITUTION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

ADVERTISEMENT.

This work is the fourth of a series of papers intended to illustrate the collections of Natural History and Ethnology belonging to the United States, and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

JOSEPH HENRY,

Secretary Smithsonian Institution.

SMITHSONIAN INSTITUTION,

Washington, February, 1876.

BIRDS

OF

SOUTHWESTERN MEXICO.

COLLECTED BY

FRANCIS E. SUMICHRAST

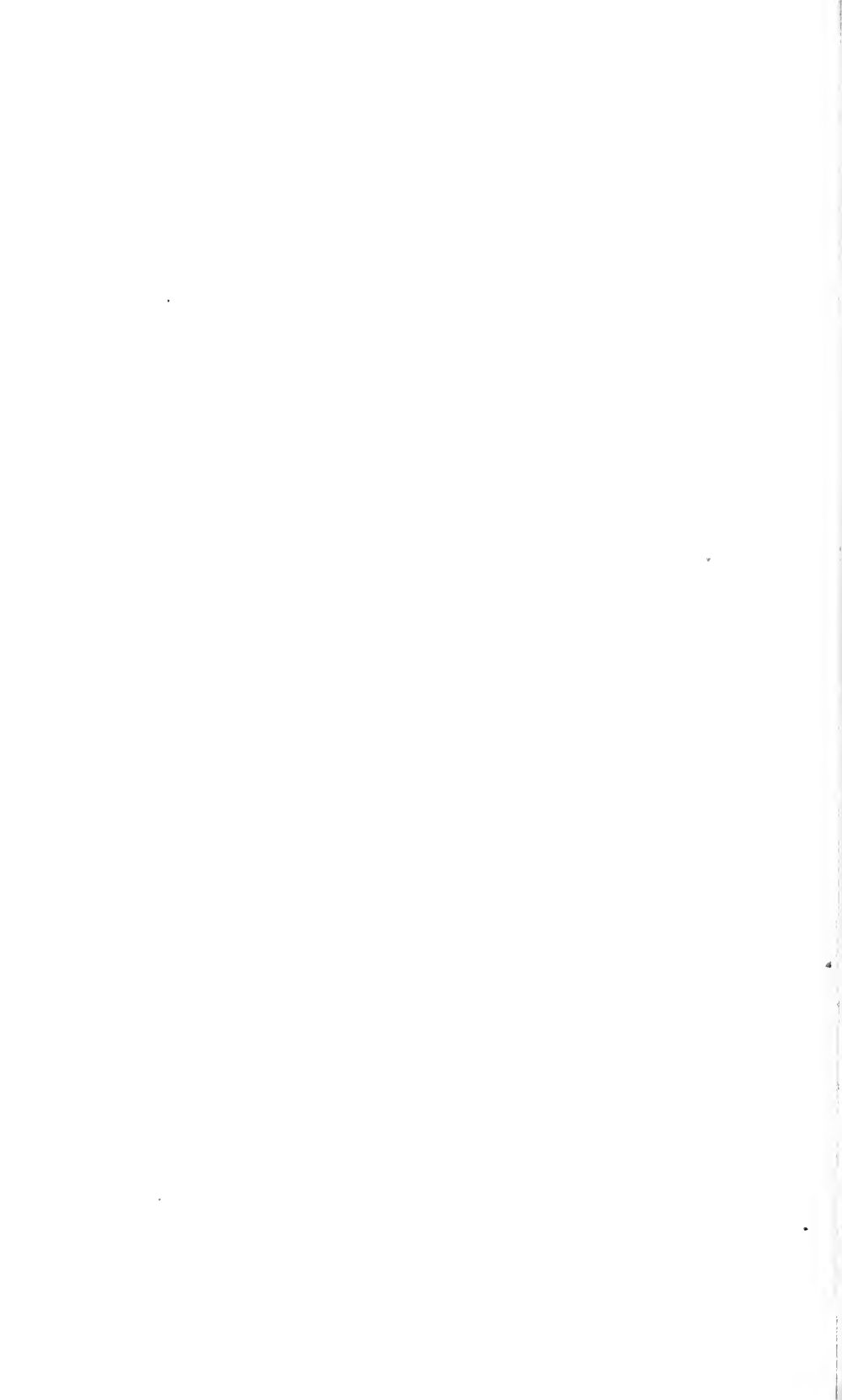
FOR THE

UNITED STATES NATIONAL MUSEUM.

PREPARED BY

GEORGE N. LAWRENCE.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1875.



CATALOGUE OF BIRDS COLLECTED BY PROF. FRANCIS SUMICHRAST, IN SOUTHWESTERN MEXICO, AND NOW IN THE NATIONAL MUSEUM AT WASHINGTON, D. C.

BY GEORGE N. LAWRENCE.

A few years since, an arrangement was made by Prof. Joseph Henry, Secretary of the Smithsonian Institution, with Prof. Francis Sumichrast, for an extended exploration of the Pacific side of the Isthmus of Tehuantepec, Southwestern Mexico, for the purpose of procuring specimens of its natural history

At the request of Professor Henry, I undertook the examination of the birds contained in these collections; and they have been forwarded to me from the Smithsonian Institution, from time to time, when received.

During the past four years, four instalments have been sent me, containing 321 species, represented by more than 1,700 specimens.

Circumstances occurred which prevented quite so full an exploration of the isthmus as was at first intended; however, the specimens sent (which are of a remarkably fine character) bear testimony to Professor Sumichrast's efficiency as an industrious and energetic collector, and the many valuable notes manifest his accuracy and intelligence as an observer.

In answer to a remark in one of my earlier letters to him, expressing my surprise that so few new species had been obtained, he says: "I am not astonished at the small number of new species that my first two collections contain. The region of the Pacific is comparatively much poorer than that of the Atlantic. This must be attributed to the extreme dryness of the soil; to the scarcity of vegetation and of insect life; and to the duration of the winds from the northeast and southwest, which there prevail with great violence."

Professor Sumichrast sent me some valuable notes on geographical distribution, which are given below.

He has sent also biographies of many species, which are in their proper places in the catalogue. Finding that these biographies did not

extend through all the families, I wrote him for an explanation, and got the following reply: "I regret to be unable to tell you certainly which are the biographies and notes that I forwarded to the Institution. Almost all my books and papers were carried off in 1871 during the pillage of my house in Juchitan, and I cannot verify the dates of my invoices to the Institution."

In December, 1871, Professor Samichrast was obliged to leave Juchitan on account of the revolutionary state of the country, and made his residence at Santa Efigenia, which he writes me is "a *hacienda* thirty leagues or so south of Tehuantepec, at the foot of the Cerro de la Gineta, and on the border of the State of Chiapas." Tapana, a locality often given, he says is "a village in the neighborhood of Santa Efigenia."

All communications from him are designated by quotation-marks.

"NOTES ON THE GEOGRAPHICAL DIVISION OF THE BIRDS IN THE ISTHMUS OF TEHUANTEPEC.

"The contraction of the American continent between the ninety-fourth and ninety-fifth degrees of longitude west from Greenwich forms what is called, quite improperly perhaps, the Isthmus of Tehuantepec, whose width between the mouth of the Rio Coatzacoalcos and the Bay of Ventosa is about one hundred and eighty miles.

"In a physical point of view, the isthmus may be considered as divided into three parts, first, an eastern, extending from the Gulf of Mexico to the Puerta; secondly, a central, from the Puerta to the Chivela; and, thirdly, a western, from the Chivela to the Pacific. The eastern part, formed principally of alluvial land and watered by the Coatzacoalcos and its affluents, has its largest portion covered with thick and damp forests, whose vegetation rivals the greatest beauties of tropical nature. The central region presents an undulating surface, embossed with innumerable *lomas*, or hills, which, rising gradually, unite on the western side with the mountains of the Sierra de los Mijes, and, toward the east, with those of the Sierra de Chimalapa. Although watered by numerous streams, it presents, nevertheless, but a scanty vegetation, essentially characterized by oaks on the side of Sarabbia, and palm-trees on the plateau of Chinela. The western division, or plains of the Pacific, is very dry, and its vegetable physiognomy presents a striking contrast to the rich plains on the Atlantic slope. Of the few rivers which flow through it, the most important are the Tehuantepec, Juchitan, Chicapa, and the Ostula. These are so low during part of the dry season that the inhabitants of the villages and *ranchos* situated on their banks have

no drinking-water but that which they draw out of holes dug in the sand.

"From that it can be easily explained how the number of animal forms, as well as the vegetable, decreases perceptibly in proportion as you advance from the Atlantic to the Pacific.

"In a zoölogical point of view, the preceding division into three regions is modified in this sense, that the central part or mean does not present any distinguishing forms which can characterize it.

"A line drawn on the map through the villages of Santa Maria, Chimalapa, and San Juan Guichicovi would indicate quite correctly enough the boundary-lines between the two zoölogical provinces or regions which divide the isthmus, and almost that of a division of the waters which flow to the Atlantic and the Pacific. Several places situated on the crest of this line present, as might be expected, a mixture of forms belonging to each littoral; thus, in the neighborhood of Barrio, *Conurus aztec* and *petzi*, *Chrysotis autumnalis* and *albifrons*, *Psilorhinus morio*, and *Calocitta formosa*, &c., are found together.

"It is to be noticed that, while the species belonging to the western province seldom or never leave it to spread in the opposite direction, several of those in the eastern province advance, on the contrary, to within a short distance of the shores of the Pacific. To quote as examples: *Turdus grayi*, *Attila citreopygia*, *Muscivora mexicana*, *Rhynchocyclus cinereiceps*, *Oncostoma cinereigulare*, *Chiroxiphia linearis*, *Chrysotis leucillanti*, *Pteroglossus torquatus*, *Penelope purpurascens*, *Crax globicera*, *Tinamus salli*, &c.; all of them species whose place of development is without contradiction in the limits of the Atlantic region, but which are found in the immediate neighborhood of the Pacific, (Santa Efigenia).

"The difference in the level of the ground, which exerts elsewhere in Mexico such a great influence over the geographical distribution of animal species, only exists in a slight degree in the Isthmus of Tehuantepec; one of the culminating points of this territory, the Cerro de Mazahua, is not elevated probably more than from 500 to 2,800 feet above the level of the sea. We must not, therefore, expect to find in the isthmus properly so called any of the indigenous species which elsewhere characterize alpine regions. The few species of that region which are found in my collections have been gathered out of the isthmus; some in the Sierra of Oaxaca, others in the mountains of Gineta and of Zapotitlan.

"If, in order to establish a sort of parallel between the two ornitho-

logical *horizons* of the isthmus, we seek what especially distinguishes the western province from that of the Gulf, we will find—

“I. That it is less remarkable for the number of forms that belong to it than for the absence of others which predominate in the eastern part, to which they give their own physiognomy, and, if I may so express it, one more essentially neotropical.

“II. That it presents, in relation to the preceding, a marked numerical inferiority in the following families: *Turdidæ*, *Tanagridæ*, *Fringillidæ*, *Momotidæ*, *Trogonidæ*, *Ramphastidæ*, *Picidæ*, *Columbidæ*, *Perdicidæ*, and *Tinamidæ*.

“III. That it is remarkable for the almost entire absence of the families *Dendrocolaptidæ*, *Formicaridæ*, and *Pipridæ*.

“Up to this time, I have only found two native species of Thrushes in the plains of the Pacific. The first, *Turdus flavirostris*, does not go southeast of the city of Tehuantepec, where it appears at distant intervals, at a period when certain fruits are ripe (*Achras*, *Spondias*, &c.) It is probable, as Professor Baird indicates (Review of North American Birds, p. 31), that its center of propagation is in the neighborhood of Colima. The second, *Mimus gracilis*, is very abundant on the dry plains which extend from Tehuantepec to Tonalá. We can give an account, it appears to me, of the numerical inferiority of the *Turdidæ* in the west of the isthmus by considering that Thrushes in general are more especially attached to cold and mountainous countries, and, as it has been seen, the same characteristics do not exist in the isthmus properly so called. Besides, the plains of the Pacific have but a scanty vegetation, formed for the greatest part of leguminous plants, which birds whose natural diet is berries (as for example *Planesticus*) seek for but little. This latter circumstance explains also the absence of several genera of *Tanagridæ*, such as *Rhamphocelus*, *Phanicothraupis*, *Lanio*, &c.

“*Trogon citreolus* is the most common Trogon in the west of the isthmus. It is less sylvicoline than its congeners; and the yellow color of its iris is not found, to my knowledge, in any other Trogon of Mexico.

“*Ramphastos carinatus* belongs to the eastern part of the isthmus, in the *terres chaudes*. *Aulacorhamphus prasinus* is not found, from what I am called upon to believe, in the isthmus proper, but only in the mountainous and temperate parts, which border it on the northwest and southeast. As to *Pteroglossus torquatus*, I have not found it elsewhere than at Santa Eligenia.

“*Momotus mexicanus* is the only species of the family that is resident

in the province of the Pacific. *M. lessoni* and *Eumomota superciliaris* occasionally appear; but they are considered to be wanderers from the province of the Gulf, where *Hylomanes momotula* also occurs.

"The resident species of *Picidae*, on the plains of the Pacific, are *Campephilus guatemalensis*, *Dryotomus scapularis*, and *Centurus aurifrons*.

"The genera *Geotrygon*, *Lepidænas*, and *Talpacotia*, of the eastern coast, are not found on the western shore of the isthmus.

"A species of *Ortyx* (*O. coyolcos*) represents the family of the *Perdidae* on the plains of the Pacific, which, in the eastern province, on the contrary numbers several representatives.

"The specimen of *Tinamus sallæi* in my collection comes from Santa Efígenia, a spot which may be considered as extra-isthmique.

"Notwithstanding my assiduous researches, I have been unable to meet with but a single representative of *Dendrocolaptidae*, *Dendroornis eburneirostris*.

"*Chiroxiphia linearis* in my collection comes from Santa Efígenia.

"In exchange for the numerical inferiority in regard to the above-mentioned families, we observe a greater development in those of the *Sylviidae*, and perhaps also of the *Tyrannidae*, particularly the genera *Polioptila* and *Myiarchus*. The eastern coast of Mexico has furnished, up to this time, but a single species of *Polioptila* (*P. carulea*), and, moreover, it probably only resides there in winter; on that of the Pacific we find, besides the preceding, two species with a black head, *P. nigriceps* and *P. albiloris*, both indigenous. *Myiarchus laurencii* is the only species of the genus which can be called common on the coast of the Gulf of Mexico. On the opposite shore, the *Myiarchi* are abundant, and are dispersed almost everywhere in the forests and on the plains.

"The following table, although very incomplete, will give a sort of parallelism of the most characteristic species of each of the two ornithological regions of the isthmus.

"CÔTE ORIENTALE.

- "*Turdus grayi*.
- "*Campylorhynchus zonatus*.
- "*Thryothorus maculipectus*.
- "*Granatellus sallæi*.
- "*Hæmophila rufescens*.
- "*Cyanospiza parellina*.
- "*Cassidulus prevosti*.

"CÔTE OCCIDENTALE.

- "*Turdus flavirostris*.
- "*Campylorhynchus humilis*.
- "*Thryothorus pleurostictus*.
- "*Granatellus venustus*.
- "*Hæmophila ruficauda*.
- "*Cyanospiza leclancheri*.
- "*Cassidulus melanieterus*.

" *Icterus mesomelas*.

" *Psilorhinus morio*.

" *Momotus lessoni*.

" *Trogon caligatus*.

" *Piaya cayana*.

" *Conurus aztec*.

" *Chrysotis autumnalis*.

" *Ortalia vetula*.

" *Ortyx pectoralis*.

" *Icterus pectoralis*.

" *Calocitta formosa*.

" *Momotus mexicanus*.

" *Trogon citreolus*.

" *Piaya mexicana*.

" *Conurus petzi*.

" *Chrysotis finschi*.

" *Ortalia poliocephala*.

" *Ortyx coyoleos*.

"The preceding remarks apply exclusively to indigenous species. It would be interesting if I could record here some facts relative to the distribution of the species which reside in the isthmus in the winter-season, or only during their flight; but this study would require several years of continued observations which were made simultaneously on both coasts. This part of Mexico is, moreover, less favorable than any other for observations of this kind. The shrinking of the continent, the absence of natural barriers, there make the dispersion of traveling-birds, from east to west and *vice versa*, very easy. Another cause, which must bring several migratory species on the shores of the Gulf of Tehuantepec in winter, is the prevalence of northeast winds in the isthmus. These winds, which blow there with extreme violence from the month of October, undoubtedly force a large number of birds that are traveling along the Atlantic shore toward Central America to swerve from this line, and push them toward the opposite coast. An analogous cause, the prevalence of southeast winds from the month of March, that is to say, that the time that the emigrant species return to the north, operates with an inverse action, by bringing the species coming from the south along the eastern shore toward the coasts of the Gulf of Mexico. I will limit myself to state here the presence in winter of *Dendroica graciae* in the mountains of Tehuantepec, and the extraordinary abundance at the same time of *Chondestes grammacus* and *Euspiza americana* on the plains of the Pacific.

"The shores of the Gulf of Tehuantepec, or, to speak more properly, those of the salt-lakes communicating with the ocean, which extend from Ventosa nearly to Tonala, are inhabited by a great number of aquatic birds. Although belonging, for the most part, to northern species, it is probable that a large number of them make their nests there. I have found there in August, a time when the migratory birds have not

yet made their appearance in Mexico, examples of *Numenius*, *Limosa*, *Calidris*, *Ereunetes*, &c.

"An interesting fact to be observed is that the greater part of the *Laridae* which I have gathered on the shores of the Gulf of Tehuantepec are identical with those of the Atlantic. I will give as examples *Chroicocephalus atricilla*, *Sterna anglica*, *Sterna antillarum*, *Hydrochelidon fissipes*, and *Rhynchops nigra*.

"Professor Baird (Review of North American Birds, p. 267, and Distribution and Migration of North American Birds) has already mentioned, as a fact worthy of notice, the presence of the first three of these species at Mazatlan. He speaks of the *S. antillarum* as a winter resident at Mazatlan, Colima, and Manzanillo. It is curious that on the shores of the Gulf of Tehuantepec the opposite appears to take place. At San Mateo del Mar, a village eight leagues from Tehuantepec, I have not seen, in the months of February and December, 1869, and February, 1870, a single bird of this species (*S. antillarum*); while in August, 1869, they appeared there in considerable numbers. The natives have assured me that in the month of June this *Sterna* makes its nest on the sand-banks which intersect the lakes in the neighborhood."

Fam. TURDIDÆ.

1. *Catharus occidentalis*, Sel.

"Sierra Madre, près Zapotitlan; January, 1870."

2. *Turdus mustelinus*, Gm.

"Tehuantepec City."

3. *Turdus swainsoni*, Cab.

"Tehuantepec (Tapana); April 14, 1869.

"Iris brown; bill black; base of lower mandible whitish; feet pale brownish."

4. *Turdus grayi*, Bp.

"Tehuantepec (Santa Efigenia); December, 1868.

"Iris brown; bill greenish-olive; feet livid fleshy.

"I have only observed this species at Santa Efigenia, where it is not very abundant, and where its presence is explained probably by the neighborhood of the Sierra de Chimalapa."

5. *Turdus flavirostris*, Sw.

"Tehuantepec City; November, 1869.

"Iris cinnamon; bill yellowish, tip dusky; feet dull flesh-color."

This is an abundant species in Western Mexico, to which section it seems to be restricted; common at Mazatlan, and also obtained on the Tres Marias Islands by Colonel Grayson.

6. *Melanotis caerulescens* (Sw.).

"Sierra Madre, *près* Zapotitlan; January, 1870."

7. *Harporhynchus curvirostris* (Sw.).

"Tehuacan (Puebla); August, 1868.

"Iris orange; bill black; feet livid blue; vulgar name *Cuitlacochi*."

8. *Mimus polyglottus* var. *caudatus*, Baird.

"Tehuantepec City; October, 1869.

"Iris orange-yellow; bill and feet black."

9. *Mimus gracilis*, Cab.

"Tehuantepec City; October, 1869.

"Iris orange-yellow; bill and feet black."

There are six specimens which I consider to be this species. They differ from examples from Yucatan in being rather smaller and more slender; in having the wings and tail brownish black, and the color of the upper plumage of a brownish ash. In Yucatan specimens, the wings and tail are deep black, and the upper parts bluish ash. These last agree closely with Cabanis's description of *M. gracilis*. The specimens under examination were collected in October. The differences in color may be seasonal.

Fam. SYLVIIDÆ.

10. *Polioptila caerulea*, Linn.

"Tehuantepec (Santa Efigenia), Juchitan; August and December, 1868.

"Iris brown; upper mandible brownish, lower whitish; feet black.

"This species, which is not uncommon in the neighborhood of Santa Efigenia, only resides there perhaps in winter, or during the flight. I have not seen it there since the month of March."

11. *Polioptila albiloris*, Schl.

"Tehuantepec (Santa Efigenia), Tehuantepec City; May and December.

"Iris dark brown; bill black, except two-thirds of basal portion of lower mandible, which is light plumbeous; feet plumbeous."

12. *Polioptila nigriceps*, Baird.

"Tehuantepec (Tapana, Santa Efigenia); Quiotepec (Oaxaca); April.

"Iris brown; basal half of lower mandible plumbeous, upper mandible and tip black; feet plumbeous.

"Common almost everywhere in the west of the isthmus and in the dry and warm districts of the State of Oaxaca; frequents the ravines and the thin woods; goes almost always in pairs."

Fam. TROGLODYTIDÆ.

13. *Campylorhynchus zonatus*, Less.

"Tehuantepec (Guichicovi); September.

"Iris cinnamon-red; upper mandible black; lower horny; feet yellowish olive."

14. *Campylorhynchus jocosus*, ScL.

"Dondominguello (Oaxaca); August, 1868.

"Iris red brown; bill blackish; feet dusky ash."

15. *Campylorhynchus humilis*, ScL.

"Tehuantepec (Santa Efigenia); Tehuantepec City.

"Iris bright brick-red; bill blackish; basal half of lower mandible and feet light plumbeous.

"This is the most common species of the genus that I have met with on the shores of the Gulf of Tehuantepec. It advances toward the northeast to San Carlos, on the route from Tehuantepec to Oaxaca. It is a very lively bird, whose song at the time of mating is agreeable and varied; except at this time, when it lives in pairs, it is almost always seen in small flocks."

16. *Salpinctes obsoletus* (Say).

"Tehuantepec (Cacoprieto); June, 1872."

17. *Cyphorinus leucostictus*, Cab.

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; bill black; feet dark plumbeous."

18. *Thryothorus maculipectus*, Lafr.

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; upper mandible black, lower horn-color; feet dark ashy-blue."

19. *Thryothorus pleurostictus*, ScL.

"Tehuantepec (Santa Efigenia), Guichicovi, Tapana; March to October.

"Iris brown; upper mandible brownish-black, lower light bluish-fleshy; feet light-brown."

"One of the indigenous birds, the most dispersed in the woody localities on the west of the isthmus, and the only sylvicoline wren that I have there met with up to this time. Endowed with extreme vivacity, it is continually in motion, running along the ground and climbing the shrubs and creepers, in search of insects; and this occupation is always enlivened by the cries of pleasure or the animated trills of the male bird, which reveal his distant position in the interior of the wood. Besides, it is quite tame, and may be easily approached; the report of a gun, even, does not appear to frighten it much. In very woody spots, several couples of them are often seen devoting themselves with ardor to the chase, or busy carrying materials destined for the construction of their nests. This nest, made with skill, is woven with dry grasses, whose stems are fine and elastic. It has the form of a retort, and is fixed horizontally around the stem of a bush, often at the fork of two branches. From the beginning of May to the middle of July, I have found these nests, containing from 3 to 5 eggs of a beautiful greenish-blue color, clear, and of a diameter of about 22 millimeters. The bottom of the nest, where the eggs rest, is lined with hairs, mingled with the fine down of certain seeds of *Bombacées*."

20. *Thryothorus bewickii* var. *leucogaster*, Baird.

"Puente Colorado; August, 1868.

"Iris brown; bill and feet dusky."

Fam. MOTACILLIDÆ.

21. *Anthus ludovicianus* (Gm.).

"Tehuantepec City; November, 1869.

"Bill blackish; base of lower mandible dull yellowish; feet brownish."

Fam. MNIOTILTIDÆ.

22. *Sciurus auricapillus* (Linn.).

"Tehuantepec (Gnichieovi); September, 1869.

"Iris brown; upper mandible blackish-brown, lower and feet light-fleshy."

23. *Sciurus noveboracensis* (Gm.).

"Tehuantepec (Tapaná); April, 1869.

"Iris brown; bill black; base of lower mandible paler; feet light-brown."

24. *Sciurus ludovicianus* (Aud.).

"Tehuantepec (Barrio, Santa Efígenia); September and January.

"Iris brown; bill blackish; lower mandible paler; feet pale-fleshy."

25. *Mniotilta varia* (Linn.).

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; upper mandible black, lower fleshy; tarsi dark olivaceous; toes olivaceous yellow."

26. *Parula americana* (Linn.).

"Tehuantepec (Santa Efígenia), Tehuantepec City; October and January.

"Iris brown; upper mandible brown, lower whitish-brown at tip; feet brownish."

27. *Helminthophaga ruficapilla* (Wils.).

"Tehuantepec (Santa Efígenia); December and January.

"Iris brown; bill bluish-ash, culmen dusky; feet olive-brown."

28. *Helminthophaga peregrina* (Wils.).

"Tehuantepec (Santa Efígenia); December and January.

"Iris brown; bill ashy, culmen and tip dusky; feet dull olive."

29. *Dendræca æstiva* (Gm.).

"Tehuantepec (Barrio, Chihuitan, Guichicovi, Santa Efígenia), Don-dominguillo (Oaxaca); August to December, January and February.

"Iris brown; upper mandible black, lower light plumbeous; feet light brownish-yellow."

30. *Dendræca virens* (Gm.).

"Tehuantepec (Santa Efígenia); December and January.

"Iris brown; bill and feet brownish."

31. *Dendræca coronata* (Linn.).

"Tehuantepec (Santa Efígenia); December and January.

"Iris brown; bill and feet black."

32. *Dendræca blackburniæ* (Gm.).

"Tehuantepec City."

33. *Dendræca castanea* (Wils.).

"Tehuantepec City; October, 1869.

"Iris brown; upper mandible brownish, lower yellowish; feet brownish-yellow."

34. *Dendræca maculosa* (Gm.).

"Tehuantepec (Santa Efigenia); December and March.

"Iris brown; bill ashy; culmen and a line along the lower mandible dusky; feet brownish, toes tinged with yellow."

35. *Dendræca dominica* var. *albilora*, Baird, Am. Nat., 1873, p. 606.

"Chiapas (Gineta Mountains); January, 1869."

36. *Dendræca graciæ*, Coues.

"Sierra Madre, *près* Zapotitlan; January, 1870."

37. *Oporornis formosus* (Wils.).

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; upper mandible brownish-black, lower brownish-black, except at base, which, with the feet, are light fleshy."

38. *Myiodiotes cærulescens* (Gm.).

"Tehuantepec (Barrio, Guichicovi); September, 1869.

"Iris brown; upper mandible brownish, lower paler; feet light brownish-yellow."

39. *Myiodiotes pusillus* var. *pilcolatus* (Pallas). See Ridgway, Am. Nat., 1873, p. 808.

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; bill brownish, lower mandible yellowish; feet light-brown."

40. *Basileuterus rufifrons* (Sw.).

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; bill black; feet fleshy."

41. *Setophaga ruticilla* (Linn.).

"Tehuantepec (Santa Efigenia); April, 1871."

42. *Setophaga picta*, Sw.

"Chiapas (Gineta Mountains); January, 1869."

43. *Setophaga miniata*, Sw.

"Sierra Madre, *près* Zapotitlan; January, 1870."

44. *Granatellus venustus*, Dubus.

"Tehuantepec (Santa Efigenia); January, 1869.

"Iris brown; upper mandible brownish-black, lower plumbeous ash; feet dull ashy-brown."

45. *Geothlypis philadelphia* var. *macgillivrayi* (Aud.).

"Tehuantepec (Chihuitan); Tehuantepec City; November, 1868.

"Iris brown; bill blackish, most of lower mandible pale; feet light flesh."

46. *Icteria virens* (Linn.).

"Tehuantepec (Chihuitan, Santa Efigenia); November and January.

"Iris brown; upper mandible blackish, lower whitish; feet dull ashy."

Fam. HIRUNDINIDÆ.**47. *Progne leucogaster*, Baird.**

"Tehuantepec (Barrio); October, 1868.

"Iris dark-brown; bill black; feet brownish."

48. *Hirundo horreorum*, Barton.

"Tehuantepec City; October. Tehuacan (Puebla); August.

"Iris brown; bill brownish-black; feet brown."

49. *Petrochelidon swainsoni*, Sel.

"Tehuantepec City; October, 1869.

"Iris and bill dark-brown; feet grayish-brown."

50. *Cotyle riparia* (Linn.).

"Tehuantepec City; October, 1869."

Fam. VIREONIDÆ.**51. *Vireosylvia flavoviridis*, Cass.**

"Tehuantepec (Tapana, Santa Efigenia); April and May.

"Iris red; bill dusky above, light ash beneath; feet light brownish-ash."

52. *Vireosylvia gilva* var. *swainsoni*, Baird.

"Tehuantepec (Santa Efigenia); January, 1869, April, 1871."

53. *Virco noveboracensis* (Gm.).

"Tehuantepec (Santa Efigenia); December, 1868."

54. *Vireo flavifrons*, Vieill.

"Tehuantepec (Santa Efigenia); Chiapas (Gineta Mountains); December and January.

"Iris brown; bill bluish-ash, culmen and tip of both mandibles dusky; feet bluish-ash."

55. *Lanivireo solitarius* (Wils.).

"Tehuantepec (Santa Efigenia); Tehuantepec City; Chiapas (Gineta Mountains); October and January.

"Iris brown; bill plumbeous, culmen and tip dusky; feet plumbeous."

56. *Vireo belli*, And.

"Tehuantepec (Santa Efigenia); Tehuantepec City; October and December.

"Iris brown; upper mandible brownish, lower and feet light plumbeous."

57. *Vireo hypochryscus*, Schl.

"Quiotepec (Oaxaca); August, 1868."

58. *Hylophilus decurtatus* (Bonap.).

"Tehuantepec (Chimalama); March, 1869.

"Iris brown; feet light-brown."

59. *Cyclorhis flaviventris*, Lafr.

"Tehuantepec (Guichicovi, Petapa); September, 1869.

"Iris cinnamon; upper mandible light-brownish fleshy, lower bluish; feet fleshy."

Fam. LANIIDÆ.**60. *Collurio ludovicianus* var. *excubitoroides* (Sw.).**

"Tehuantepec City; October, 1869.

"Iris brown; bill black; base of lower mandible paler; feet dull grayish-ash."

Fam. AMPELIDÆ.**61. *Ampelis cedrorum* (Vieill.).**

"Tehuantepec."

Fam. TANAGRIDÆ.**62. *Euphonia affinis* (Less.).**

"Tehuantepec (Barrio); Tehuantepec City; October, 1868.

"Iris brown; bill black, bases of both mandibles light-bluish; feet dark lead-color."

63. *Euphonia hirundinacea*, Bp.

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; upper mandible and tip of lower black, rest of lower bluish; feet ashy-plumbeous."

64. *Chlorophonia occipitalis* (Du Bus.).

"Chiapas (Gineta Mountains); January, 1869."

65. *Tanagra abbas*, Licht.

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; bill black; feet dark-plumbeous."

66. *Pyrranga æstiva* (Gm.).

"Tehuantepec (Chihuitan, Santa Efigenia); November and January.

"Iris brown; bill light fleshy-brown; culmen dusky; feet brownish."

There are four specimens (two of each sex), which do not differ from specimens of *P. æstiva* from the Atlantic States. The variety named *P. cooperi* by Mr. Ridgway thus appears to range farther to the north.

67. *Pyrranga hepatica*, Sw.

"Tehuantepec (Guichicovi); Chiapas (Gineta Mountains); September and January.

"Iris brown; bill bluish, culmen and tip of lower mandible dusky; feet light brownish-ash."

68. *Pyrranga ludoviciana* (Wils.).

"Tehuantepec (Ishuatlan, Santa Efigenia); December and January.

"Iris brown; bill yellowish, culmen dusky; feet dark ashy."

69. *Phænicothraupis rubicoides* (Lafr.).

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; bill and feet hazel-brown."

70. *Phænicothraupis fuscicauda*, Cab.

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; bill black, tip yellow; feet light-brown."

71. *Lanio aurantius*, Lafr.

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; bill black; feet grayish."

72. *Saltator grandis* (Licht.).

"Tehuantepec (Santa Efigenia); January, 1869."

73. *Saltator atriceps*, Less.

"Tehuantepec (Guichicovi, Santa Efigenia); September, December, and February.

"Iris brown; bill black; feet brownish."

Fam. FRINGILLIDÆ.**74. *Hedymeles ludovicianus* (Linn.).**

"Tehuantepec (Santa Efigenia); January, 1869."

75. *Cardinalis virginianus* var. *carneus*, Less.

"Huamelula."

76. *Guiraca caerulea* (Linn.).

"Tehuantepec (Chihuitan); Huitzo, near Oaxaca; August and November."

"Iris brown; bill and feet dusky."

77. *Guiraca parellina* (Licht.).

"Tehuantepec City, Huallago; October and December."

"Iris brown; bill and feet grayish-brown."

78. *Volatinia jacarina* (Linn.).

"Tehuantepec (Guichicovi); September, 1869."

"Iris brown; bill black, most of lower mandible bluish; feet blackish."

79. *Phonipara pusilla* (Sw.).

"Dondomingullo (Oaxaca); August, 1868."

"Iris brown; bill black; feet light-brown."

80. *Cyanospiza cyanea* (Linn.).

"Tehuantepec (Santa Efigenia); December, 1868."

"Iris brown; bill dull fleshy; feet brownish."

81. *Cyanospiza ciris* (Linn.).

"Tehuantepec (Santa Efigenia); Tehuantepec City; November and December."

"Iris brown; bill and feet brownish."

82. *Cyanospiza leclancheri* (Lafr.).

"Tehuantepec (Tapana); Tehuantepec City; April and October."

"Iris brown; upper mandible brown, lower fleshy; feet brownish."

83. *Cyanospiza rositæ*, Lawr. Ann. Lyc. N. Y., vol. x, p. 397.

"Tehuantepec (Cacoprieto); January, 1872."

"Iris brown; upper mandible blackish; lower pale-bluish; feet livid-plumbeous. Total length, 14 centimeters; wing, 72 millimeters; tail, 55 millimeters."

Since my description of the male of this species, the missing specimens, fortunately, have been received. An examination of the male shows no point of difference from my description worthy of comment.

There is but a single specimen of the female (the only one as yet obtained), of which a description is now given.

Plumage above of a dull ochreous-brown, tinged with blue on the

head and lower back; rump and upper tail coverts dull light-blue; middle tail-feathers dull blue, the outer webs of the other tail-feathers similar in color, the inner webs blackish-brown; quill-feathers dark-brown; the smaller wing-coverts and the outer edges of the larger quills pale-blue; the other wing-coverts and the tertiaries have margins the color of the back; chin grayish; under plumage of a dull brownish rose-color, paler and clearer on the abdomen and under tail-coverts; bill and feet similar in color to those of the male. Types in National Museum, Washington, D. C.

84. *Euspiza americana* (Gm.).

"Tehuantepec (Juchitan, Guichicovi); Tehuantepec City; September and October.

"Iris brown; bill brownish, tinged with yellow; feet hazel-brown."

85. *Passerculus savanna* var. *alaudinus*, Bp.

"Tehuantepec City; November, 1869.

"Iris brown; upper mandible brownish, lower mandible and feet fleshy."

86. *Zonotrichia mystacalis*, Hartl.

"Tehuacan (Puebla); August, 1868.

"Iris reddish-brown; upper mandible black, lower light-blue; feet fleshy."

87. *Spizella socialis* (Wils.).

"Chiapas (Gineta Mountains); January, 1869.

88. *Spizella socialis* var. *arizonæ*, Cones.

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; upper mandible brown, lower mandible lighter; feet brownish flesh."

89. *Spizella atrigularis*, Cab.

"Chapulco (Puebla); January, 1868.

"Iris brown; bill brownish-orange; feet brownish."

90. *Peucea ruficeps* var. *boucardi*, Sel.

"Puente Colorado (Puebla); August, 1868.

"Iris brown; upper mandible horny-brown, lower bluish; feet fleshy."

91. *Coturniculus passerinus* (Wils.).

"Tehuantepec City; November, 1869.

"Iris brown; upper mandible dusky, lower light-bluish; feet fleshy."

92. *Embernagra rufivirgata*, Lawr.

“Huamelula.”

93. *Hamophila rufescens*, Sw.

“Tehuantepec (Guichicovi); September, 1869.

“Iris brown; upper mandible black, lower bluish; feet dark flesh-color.”

94. *Hamophila ruficauda* (Bonap.).

“Tehuantepec (Juchitan, Santa Efigenia); Tehuantepec City.

“Iris light reddish-brown; upper mandible black, lower bluish-fleshy; feet fleshy-brown.”

95. *Hamophila sumichrasti*, Lawr., Ann. N. Y. Lye., vol. x, p. 6.

“Tehuantepec (Juchitan); September, 1868.

“Iris brownish-red; upper mandible blackish, lower mandible and feet fleshy.”

96. *Pipilo maculatus*, Sw.

“Cieneguilla (Oaxaca, alpine region).”

97. *Pipilo albicollis*, Sel.

“Huitzo, near Oaxaca; August, 1868.

“Iris brown; upper mandible brownish, lower bluish-ash; feet grayish-brown.”

98. *Chondestes grammaca* (Say).

“Tehuantepec (Chihuitan, Santa Efigenia); November, December, and January.

“Iris brown; bill bluish; culmen and tip dusky; feet fleshy.”

99. *Chrysomitris notata* (Du Bus.).

“Chiapas (Gineta Mountains); January, 1869.

“Iris brown; upper mandible blackish-brown, lower dull-ashy; feet brownish.”

Fam. ALAUDIDÆ.**100. *Eremophila alpestris* var. *chrysolæma* (Wagl.).**

“Tehuantepec (San Mateo); August, 1869.

“Probably resident on the Pacific plains, where it seems to be abundant in July and August.

Fam. ICTERIDÆ.**101. Cassiculus melanicterus** (Bp.).

"Tehuantepec (Barrio, Chihuitan); Tehuantepec City; October, November, and December.

"Iris brown; bill greenish-white; feet blackish-brown.

"This bird (called by the Creoles *Tordo de fierro* (Iron Thrush), and by the Zapotèques *bigoseguiba*, which has the same meaning), although proper to Western Mexico, often wanders from the coast. A few years ago I found it near Tehuacan (State of Puebla). In the isthmus it is especially abundant near Chihuitan and Huallaga. Like *Cassicus prevosti*, it has a disagreeable smell, and is generally infested with vermin."

102. Cassicus prevosti (Less.).

"Tehuantepec (Guichicovi, Santa Efigenia); May and September.

"Iris light-yellow; bill yellowish-white; feet bluish-ash."

103. Icterus prothemelas (Strickland).

"Tehuantepec (Chihuitan); December, 1868."

104. Icterus melanocephalus (Wagl.).

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; bill black; base of lower mandible and feet bluish-ash."

105. Icterus mesomelas (Wagl.).

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; bill black; base of lower mandible and feet bluish-ash."

106. Icterus gularis (Wagl.).

"Tehuantepec (Barrio, Chihuitan, Juchitan, Santa Efigenia).

"Iris brown; bill black, with the base of the lower mandible and feet bluish-ash."

107. Icterus pectoralis (Wagl.).

"Tehuantepec (Juchitan, Santa Efigenia); June and September.

"Iris dark-brown; bill black; base of lower mandible bluish; feet bluish-ash."

108. Icterus formosus, Lawr., Ann. N. Y. Lye., vol. x, p. 184.

"Tehuantepec (Santa Efigenia, Juchitan); June, September, and December.

"Iris brown; bill black; base of lower mandible and feet light-plumbeous."

109. *Icterus spurius* var. *affinis*, Lawr.

"Tehuantepec (Chihuitan, Santa Efigenia); Tehuantepec City.

"Iris brown; upper mandible black, lower ashy-blue; feet dark ashy-blue."

110. *Molothrus æneus* (Wagl.).

"Tehuantepec (Tapana); April, 1869.

"Iris red; bill and feet black."

111. *Molothrus peccoris* var. *obscurus* (Gm.).

"Tehuantepec City; October, 1869.

"Iris brown; feet black."

112. *Sturnella magna* var. *mexicana*, Sel.

"Tehuantepec (Barrio, Santa Efigenia); September and February.

"Iris hazel-brown; feet light fleshy-brown."

113. *Quiscalus macrurus*, Sw.

"Tehuantepec (Barrio, Juchitan); September and October.

"Iris pale-yellow; bill and feet black."

114. *Quiscalus mexicanus*, Cass.

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; bill and feet black; inside of bill yellow."

Fam. CORVIDÆ.**115. *Cyanocitta coronata* (Sw.).**

"Cieneguilla (Oaxaca, alpine region); August, 1868.

"Iris brown; bill and feet black."

116. *Cyanocitta californica* var. *sumichrasti*, Ridg.

"Nacaltepec (Oaxaca); August, 1868.

"Iris brown; bill and feet black."

117. *Calocitta formosa* (Sw.).

"Tehuantepec (Juchitan); Tehuantepec City; August, September, and November.

"Iris brown; bill and feet black.

"This is the most widely scattered and the greatest busybody of all the birds of the isthmus. You cannot take a step out of inhabited localities without being assailed by the vexatious scoldings of these *Chavis* (that is the name which is given to them). Not content with

hooting at you as you pass, they torment you, follow you, cross the road in front of you, and accompany these gymnastic performances by clapping their bills, by whistling, by scolding in every tone and on every key. Excessively bold, it does not fear to approach farms and feed upon the meat which is put out to dry in the sun (*tusajo*), in company with species of *Cathartes* and *Quiscalus*. If an animal, a horse or an ox, for example, should fall exhausted from the effects of a wound, the *Charis* make no scruple of attacking the wounded spot, either to carry off the pieces of flesh which are loose, or perhaps to obtain the larvæ of carnivorous flies which are developed there."

118. *Xanthura guatemalensis* (Bp.).

"Tehuantepec (Santa Efigenia); December and January.

"Iris yellow; bill black; feet ashy-blue."

119. *Psilorhinus morio* (Licht.).

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; bill yellow; feet black, mixed with yellow."

120. *Corvus corax* var. *carnivorus*, Bartram.

"Tehuantepec (Barrio, Tapaná); April, 1869.

"Iris brown; bill and feet black."

Fam. DENDROCOLAPTIDÆ.

121. *Dendroornis eburneirostris* (Sw.).

"Tehuantepec (Guichicovi, Ishuatlan, Tapaná, Santa Efigenia).

"Iris brown; bill whitish horn-color; sides of upper mandible brownish; feet dull-olive."

Fam. TYRANNIDÆ.

122. *Attila citreopygius* (Bp.).

"Tehuantepec (Santa Efigenia); May, 1871.

"Iris cinnamon; bill horny; feet plumbeous."

123. *Sayornis sayus* (Bp.).

"Chapulco (Puebla); August, 1868.

"Iris brown; bill and feet black."

124. *Sayornis nigricans* (Sw.).

"Tanatepec."

125. *Todirostrum schistaceiceps*, ScL.

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; bill black, extreme tip whitish; feet light-bluish."

126. *Oncostoma cinereigulare*, ScL.

"Tehuantepec (Guichicovi, Cacoprieto, Tapana, Santa Efigenia); April to September.

"Iris grayish-white; bill black; medial face of lower mandible whitish; feet fleshy."

127. *Ornithion incanescens* (Max.); (*Camptostoma imberbe*, ScL., see P. Z. S., 1873, p. 577).

"Tehuantepec (Santa Efigenia); December and January.

"Iris brown; bill black; base of lower mandible yellowish; feet blackish-ash; commissure and mouth orange."

128. *Myiozetetes texensis* (Giraud).

"Tehuantepec (Juchitan, Barrio, Chihuitan, Santa Efigenia).

"Iris brown; bill and feet black."

129. *Rhynchocyclus cinereiceps* (ScL).

"Tehuantepec (Tapana, Santa Efigenia); January to May.

"Iris pearl-gray; upper mandible blackish; lower mandible and feet dull flesh-color; interior of mouth black."

130. *Pitangus derbianus* (Kau).

"Tehuantepec (Chihuitan, Tapana, Santa Efigenia).

"Iris brown; bill and feet black."

131. *Myiodynastes luteiventris*, Bp.

"Tehuantepec (Tapana); April, 1869.

"Iris brown; bill black; extreme base of lower mandible dull-fleshy; feet dark brownish-ash."

132. *Megarhynchus mexicanus* (Lafr.).

"Tehuantepec (Guichicovi, Chihuitan, Santa Efigenia).

"Iris brown; bill and feet black."

133. *Muscivora mexicana*, ScL.

"Tehuantepec (Tapana, Santa Efigenia); June and December.

"Iris brown; bill black; central part of lower mandible yellowish; feet fleshy-yellow."

134. *Pyrocephalus rubineus* var. *mexicanus*, Sel.

"Tehuantepec (Santa Efigenia); Tehuantepec City.

"Iris brown; bill and feet black."

135. *Empidonax minimus* (Baird).

"Tehuantepec (Chihuitan, Santa Efigenia, Tapana, Guichicovi); Tehuantepec City; Chiapas (Gineta Mountains).

"Iris brown; upper mandible brownish-black, lower dull-fleshy; feet black."

136. *Empidonax flaviventris* (Baird).

"Tehuantepec (Guichicovi, Santa Efigenia); December and January.

"Iris brown; upper mandible brownish-black, lower yellowish; feet blackish."

137. *Empidonax traillii* var. *pusillus* (Sw. et Rich.).

"Tehuantepec City; October, 1869.

"Iris brown; upper mandible black, lower light-brownish; feet black."

138. *Empidonax hammondi* (De Vesey).

"Chiapas (Gineta Mountains); January, 1869.

"Iris brown; upper mandible blackish, lower light-brownish; feet black."

139. *Contopus borealis* (Sw.).

"Tehuantepec (Icacoprieto); September, 1872."

140. *Contopus pertinax*, Cab. et Heine.

"Chiapas (Gineta Mountains); January, 1869."

141. *Contopus virens* (Linn.).

"Tehuantepec (Tapana); April and May.

"Iris brown; upper mandible black, lower dull-yellow; feet black."

142. *Contopus virens* var. *richardsonii* (Sw.).

"Tehuantepec (Tapana); Tehuantepec City; April, May, and October.

"Iris brown; upper mandible black, basal half of lower brownish-yellow; feet black."

143. *Myiarchus crinitus* (Linn.).

"Tehuantepec City; October, 1869.

"Iris brown; bill black, lighter at the base of lower mandible; feet blackish."

144. *Myiarchus crinitus* var. *cooperi* (Kaup).

"Tehuantepec (Tapana, Santa Efigenia); April and December.

"Iris brown; bill black; feet dark ashy-brown."

145. *Myiarchus cinerascens* (Lawr.).

"Tehuantepec (Tapana, Santa Efigenia); Tehuantepec City; Chiapas (Gineta Mountains); April, October, November, and January.

"Iris brown; bill black; extreme base of lower mandible dull-fleshy; feet blackish."

146. *Myiarchus lawrencei* (Giraud).

"Tehuantepec (Santa Efigenia); Dondominguillo (Oaxaca)."

147. *Myiarchus flammulatus*, Lawr., Ann. Lyc. N. Y., vol. xi, p. 71.

"Tehuantepec (Cacoprieto); June, 1872."

148. *Tyrannus melancholicus* var. *satrapa* (Licht.).

"Tehuantepec (Chihuitan, Tapana, Barrio); Dondominguillo (Oaxaca).

"Iris dark-brown; bill black; feet brownish."

149. *Tyrannus crassirostris*, Sw.

"Tehuantepec (Chihuitan); Los Cues (Oaxaca).

"Iris dark-brown; bill and feet blackish."

150. *Tyrannus carolinensis* (Gm.).

"Tehuantepec (Tapana); May, 1869.

"Iris brown; bill black; feet dark-plumbeous."

151. *Milvulus forficatus* (Gm.).

"Tehuantepec (Chihuitan); Tehuantepec City.

"Iris brown; upper mandible blackish, lower paler; feet brown."

Fam. COTINGIDÆ.**152. *Tityra personata*, Jard. and Selb.**

"Tehuantepec (Tapana, Santa Efigenia); March, April, and January.

"Iris dull cinnamon-red; bill black at end for half its length; basal half of bill, lores, and orbits pale-carmine; feet ashy-brown."

153. *Hadrostomus aglaia* (Lafr.).

"Dondominguillo (Oaxaca); August, 1868.

"Iris brown; upper mandible blackish, lower bluish horn-color; feet ashy-blue."

Fam. PIPRIDÆ.**154. *Chiroxiphia linearis* (Bonap.).**

"Tehuantepec (Tapana); June, 1869.

"Iris dark-brown; bill black; feet orange.

"This Manakin, the only one that I have found in the western part of the isthmus, dwells only in certain localities, thickly wooded, at the foot of the Cordilleras, on the banks of streams, and still it is only in the solitary ravines and the most shady nocks that they need be looked for. Very difficult to discover at any other time in the midst of the thick forests that they choose for their dwelling, their retreat is easily discovered in the breeding-season by the loud and continuous cries made by the males during the greater part of the day. Two males are almost always found together, perched side by side on the same branch; a curious fact which I have a long time wondered at, but the following observation enlightened me. A female, pluming herself, is perched a few steps away from these two gallants, who, anxious to please her, begin a loving joust the most diverting, ascending and descending with their wings half-closed, their feathers disheveled, and their throats inflated with pleasure and the effort of singing. This continues sometimes for more than a quarter of an hour, and recommences after a few minutes' rest, during which the female shows her pleasure by the trembling of her body and the fluttering of her wings. Nothing can be more graceful than this picture when a ray of sunlight, piercing the dark vault of the forest, enlivens the scene and brings out the bright tints of black velvet, of azure and purple that adorn the coats of these little feathered actors. With an excessive natural confidence, the *Chiroxiphia* allow themselves to be approached very near without showing any fear, and the sound of a gun hardly frightens them."

Fam. MOMOTIDÆ.**155. *Momotus lessoni*, Less.**

"Tehuantepec (Guiehicovi, Chimalapa); March and September.

"Iris red; bill black; feet blackish."

156. *Momotus mexicanus* (Sw.).

"Tehuantepec (Chihuitan, Barrio, Santa Efigenia); Los Cues (Oaxaca); August to December.

"Iris red; bill black; base of lower mandible whitish horn-color; feet dull-cinereous.

"This is very common in all the western regions of the isthmus from Barrio to the Pacific. It comes from there through the State of Oaxaca to Tehuacan (Puebla), where it is not rare. It is almost universally called *guarda-barranca* or *garde ravin*, because it generally lives in ravines, and digs its nest along the sides."

157. *Eumomota superciliaris* (Sandb.).

"Tehuantepec (Tapana, Cacoprieto); April and May.

"Iris dark-brown; bill black; feet grayish-black."

Fam. ALCEDINIDÆ.

158. *Ceryle torquata* (Linn.).

"Tehuantepec (Chihuitan, Santa Efigenia); November and December.

"Iris dark-brown; bill black; base of both mandibles grayish; feet light olive-green."

159. *Ceryle alcyon* (Linn.).

"Tehuantepec (Santa Efigenia); December, 1868.

"Iris dark-brown; bill black, basal half of lower mandible whitish horn-color; feet dusky."

160. *Ceryle amazona* (Lath.).

"Tehuantepec (Chihuitan, Santa Efigenia); November, December, and January.

"Iris dark-brown; bill and feet black."

161. *Ceryle americana* var. *cabanisi*, Tsch.

Tehuantepec (Chihuitan, Santa Efigenia); November, December, and January."

162. *Ceryle superciliosa* (Linn.).

"Tehuantepec (Santa Efigenia); April, 1871.

"Iris brownish-black; bill black; base of lower mandible fleshy; feet dark-brown."

Fam. BUCCONIDÆ.

163. *Bucco dysoni*, Gray.

"Tehuantepec (Santa Efigenia); May, 1871.

"Iris dark purplish-red; feet dull-plumbeous; bill black."

Fam. TROGONIDÆ.**164. Trogon puella, Gould.**

"Tehuantepec (Guichicovi, Chimalapa); March and September.

"Iris brown; bill yellow; feet yellowish."

165. Trogon braccatus, Cab. et Heine.

"Tehuantepec (Guichicovi); September, 1869.

"Iris dark-brown; bill ashy-blue; orbits yellow; feet plumbeous."

166. Trogon citreolus, Gould.

"Tehuantepec (Chihuitan, Ventosa, Tapana, Santa Efigenia).

"Iris yellow; eyelids violet-blue; bill bluish-ash; feet cinereous."

Fam. CAPRIMULGIDÆ.**167. Chordeiles texensis, Lawr.**

"Tehuantepec (San Mateo, Santa Efigenia); August and January, 1869.

"Iris dark-brown; bill brownish; feet dull-brown.

"At Santa Efigenia, where I killed most of the specimens of this Night-hawk, they live during the day hidden at the foot of mountain in woods and thickets. They come out a short time after sunset, and then appear in great numbers above inundated places and savannas. Their flight is easy and graceful; but it is quite difficult to shoot them, because they easily escape from sight on account of their dark color and the feeble light of the twilight."

168. Antrostomus vociferus (Wils.).

"Tehuantepec City; November, 1869."

169. Nyctidromus albicollis (Gm.).

"Tehuantepec (Chihuitan, Santa Efigenia); November, December, and January.

"Iris dark-brown; bill pale-brown, tip dusky; feet dull-fleshy.

"This species is very common in all the warm and temperate lands of Southern Mexico, where it is known under the name of *Tapas camina* (*conore chemin*) or *Ataja camina* (*qui embarrasse le chemin*), derived from the custom it has of lying flat on the roads. Its cry, which is of two kinds, may be expressed by the syllable *piou - piou - piou - piou - pu - e - i - ou*. The latter part, uttered with force, is probably a cry of appeal (or challenge). The second, which it repeats from time to time, is shorter, *ou - i - iou*."

170. *Nyctibius jamaicensis* (Gm.).

"Tehuantepec (Santa Efigenia)."

Fam. CYPSELIDÆ.**171. *Chætura vauxii* (Townsend).**

"Tehuantepec (Guichicovi); September, 1869.

"Iris dark brown; bill black; feet blackish."

Fam. TROCHILIDÆ.**172. *Campylopterus hemileucurus* (Licht.).**

"Chiapas (Gineta Mountains); January, 1869."

173. *Lampornis prevosti* (Less.).

"Tehuantepec (Santa Efigenia); December, January, and February.

"Iris dark brown; bill and feet black."

174. *Trochilus colubris*, Linn.

"Tehuantepec (Santa Efigenia); Tehuantepec City; October, November, and December.

"Iris brown; bill and feet black."

175. *Helimaster pallidiceps*, Gould.

"Tehuantepec (Santa Efigenia); December and January."

176. *Helimaster leocadia* (Bourc.).

"Tehuantepec City; October and November, 1869.

"Iris, bill, and feet black."

177. *Helimaster constanti* (Delatt.).

"Chiapas (Gineta Mountains); January, 1869."

178. *Cyanomia cyanocephala* (Less.).

"Tehuantepec (Guichicovi); September and January.

"Iris black; upper mandible black, lower bright carmine, with the tip black; feet black."

179. *Cyanomia violiceps* (Gould).

"Tehuantepec (Tapana, Santa Efigenia); May, December, and January.

"Iris brown; bill rosy-red, tip black; feet plumbeous."

180. *Pyrrhophæna cinnamomea* (Less.).

"Tehuantepec (Santa Efigenia); December and January.

"Iris black; bill bright carmine-red, tip black."

181. *Pyrrhophæna devillei* (Boure.).

"Chiapas (Gineta Mountains); January, 1869."

182. *Pyrrhophæna riefferi* (Boure.).

"Tehuantepec (Guichicovi); September, 1869."

183. *Thaumatias candidus* (Boure. et Muls.).

"Tehuantepec (Guichicovi); September, 1869.

"Iris black; upper mandible black, lower light carmine, with the tip black; feet black."

184. *Circe doubledayi* (Boure.).

"Tehuantepec (Chihuitan); November, 1868."

A single specimen of this rare species is in the collection, and the only one I have ever seen. Mr. Gould, in his monograph of *Trochilidae*, says but two specimens were known. Since that time, however, others may have been obtained. I wrote two years since to Professor Sumichrast to endeavor to procure more examples, but he has not as yet been able to do so. Its locality is now determined, which, at the time it was described by Mr. Bourcier, was thought to be the "Rio Negro," though Mr. Gould states that his specimen was marked as from "Chimantla, Mexico," which he thought was correct, as its allies, "with obscure tippings to their tails, such as *latirostris*, *caniveti*, *auriceps*, &c., were denizens of that country."

185. *Chlorolampis canaveti* (Less.).

"Tehuantepec (Guichicovi); September, 1869.

"Iris and feet black; basal two-thirds of bill carmine-red, terminal third black."

Fam. CUCULIDÆ.**186. *Crotophaga sulcirostris*, Sw.**

"Tehuantepec (Juchitan); September, 1868.

"Iris dark brown; bill and feet black."

187. *Diplopterus navius* (Linn.).

"Tehuantepec (Santa Efigenia)."

188. *Piaya cayana* (Linn.).

"Tehuantepec (Chihuitan, Barrio); September and November.

"Iris red; bill, lores, and orbits light olive-green; feet bluish-ash."

189. *Piaya ridibundus* (Gm.).

"Tehuantepec City."

190. *Morococcyx erythropygia* (Less.).

"Tehuantepec (Chihuitan), Tehuantepec City; October and December.

"Iris brown; bill orange-brown; culmen blackish; orbital skin greenish-yellow before the eye and azure-blue behind the eye; feet dull fleshy.

"Similar to *Geococcyx mexicanus* in its terrestrial habits. Indeed, it never alights except on the lowest bushes; woody places, *les bejucales* (places full of entangled creepers), and hedges are its favorite spots. It runs very quickly, and easily escapes from sight. Its flesh, like that of the *Geococcyx*, has an unsavory and disagreeable odor."

191. *Geococcyx mexicanus* (Gm.).

"Tehuantepec (Juchitan); August and September.

"Iris brown, separated from the pupil by a narrow golden ring; orbital skin blue and red; bill bluish-gray, culmen dusky; feet livid-bluish.

"This bird, quite common in the west of the isthmus, there bears the name of *Corre-camino* (Spanish) or *Ceré-quidja* (Zapotique)."

Fam. RAMPHASTIDÆ.**192. *Pteroglossus torquatus* (Gm.).**

"Tehuantepec (Santa Efigenia); January and March.

"Iris yellow; orbital skin red; feet greenish-olive.

"Common in the woods at the foot of the Cordilleras at Santa Efigenia, at Tapaná, at Tanatepec, &c. I have been told that *Ramphastos carinatus* is found at times in the same localities. I have not there met with it."

193. *Campephilus guatemalensis* (Hartl.).

"Tehuantepec (Chihuitan), Tehuantepec City; November and December.

"Iris light yellow; bill horny-white; feet ashy."

194. *Dryocopus scapularis* (Vig.)

"Tehuantepec (Chihuitan, Santa Efigenia); November and December.

"Iris white; bill white; feet dark ashy-blue."

195. *Picus scalaris*, Wagl.

"Puente, Colorado (Puebla); August, 1868.

"Iris brown; bill blackish; feet greenish."

196. *Sphyrapicus varius* (Linn.).

"Tehuantepec (Santa Efigenia), Chiapas (Gineta Mountains); January, 1869.

"Bill horny; feet dull greenish."

197. *Chloronerpes aeruginosus* (Licht.).

"Tehuantepec (Tapana, Guichicovi); Chiapas (Gineta Mountains); April, September, and January.

"Iris brown; bill black; feet bluish-ash."

198. *Melanerpes formicivorus* (Sw.).

"Tehuantepec (Guichicovi); Chiapas (Gineta Mountains); September and January."

199. *Centurus aurifrons* (Wagl.).

"Tehuantepec (Chihuitan, Juchitan, Santa Efigenia); September, November, and January.

"Iris red; bill blackish; feet dull greenish-ash."

200. *Centurus hypopolius* (Wagl.).

"Chapulco (Puebla); August, 1868.

"Iris brown; bill blackish; feet ashy-blue."

This seems to be a rare species, as there is but a single specimen in the collection, and I have not met with it in collections from other parts of Mexico or from Guatemala.

Fam. PSITTACIDÆ.**201. *Ara macao* (Linn.).**

"Tehuantepec (Santa Efigenia); Tehuantepec City, December.

"Iris yellow; upper mandible whitish, lower black; skin of cheeks rosy-white; feet black.

"Excessively common in all the western part of the isthmus, especially between Nilttepec and Tapana. It ascends very high on the sides of the Cordillera, where it is even seen in the pine-forests."

202. *Ara militaris* (Linn.).

"Mountains north of Tehuantepec."

203. *Conurus aztec*, Souancé.

"Tehuantepec (Guichicovi); September, 1869.

"Iris reddish-yellow; bill whitish; feet black."

204. *Conurus petzii* (Leibl).

"Tehuantepec (Juchitan, Chihuitan, Santa Efigenia); September, November, and December.

"Iris and orbital skin yellow; bill yellowish-white; feet yellowish, marbled with brownish.

"Everywhere abundant; this species lives indifferently in the woods, on plains, and in the neighborhood of inhabited places. It is the same with *Chrysotis albifrons*."

205. *Brotegerys tovi* (Gm.).

"Tehuantepec (Tapana); June, 1869.

"Iris brown; cere whitish; bill light brown; feet fleshy.

"This little paroquet appears confined in the west of the isthmus to the neighborhood of the villages of Zanatepec and Tapana, where it is called *Catarina* or *Gachupina*. It never leaves the thick woods, where it keeps on the largest and highest trees, which makes its capture quite difficult, because it is confounded with the foliage. It is sought as a pleasure bird on account of its small size and the ease with which it may be tamed. The Indians of the valley of Oaxaca, who come to trade in the State of Chiapas, bring a great number to sell in the interior."

206. *Chrysotis farinosa* (Bodd.).

"Santa Maria (Chimalapa).

"Another species of *Chrysotis*, although it may be rare, lives in the neighborhood of Tapana (its body is entirely green, the nape of the neck and at times the forehead are spotted with yellow, its beak is blackish, its size that of *C. ochroptera*). I regret that I have been unable as yet to procure specimens of it. I have only seen it in captivity."

207. *Chrysotis aureopalliata* (Less.).

"Tehuantepec (Santa Efigenia); May, 1871.

"Iris orange-red; bill blackish; cere black; feet grayish."

208. *Chrysotis levaillantii*, Gray.

"Tehuantepec (Barrio, Petapa); October, 1868.

"Iris orange; bill and feet dirty white."

209. *Chrysotis autumnalis* (Linn.).

"Tehuantepec (Barrio); September, 1868.

"Iris orange-yellow; bill dull yellowish, blackish along the cutting-edges; feet light greenish-ash."

210. *Chrysotis albifrons*, Sparrm.

"Tehuantepec (Chihuitan, Juchitan); Tehuantepec City; October and November.

"Iris yellowish-white; bill light yellow; cere and feet dull white."

211. *Chrysotis finschi*, Sel.

"Tehuantepec City; October, 1869.

"Iris orange; bill dirty-white; feet light gray."

Fam. STRIGIDÆ.**212. *Glaucidium ferruginum* (Max.).**

"Tehuantepec (Santa Efigenia); Tehuantepec City; Chiapas (Gineta Mountains); October, January, and March.

"Iris yellow; bill, cere, and feet greenish-yellow."

213. *Glaucidium gnoma* (Wagl.).

"Tehuantepec (Tapana); Tehuantepec City; May and October.

"Iris yellow; bill, cere, and feet greenish-yellow."

214. *Speotyto cunicularia* var. *hypogæa* (Bp.).

"Tehuantepec (Juchitan); January, 1870."

215. *Bubo virginianus* (Gm.).

"Tehuantepec City; October, 1869.

"Iris yellow; bill blackish; feet dull grayish; nails blackish."

216. *Ciccaba nigrolineata*, Sel.

"Tehuantepec City."

217. *Ciccaba squamulata* (Licht.).

"Tehuantepec City; November, 1869."

Upper plumage dark brown, mottled with pale rufous; head, neck, and upper part of back rather sparsely marked with small fulvous-white spots; tail blackish-brown, crossed with six white bars, which are more or less clouded with light brown, ends of tail-feathers white; quills blackish-brown, with faint lighter bars on the inner webs and pale fulvous bars on the outer; inner webs of secondaries clear, very pale fulvous; under lining of wings dark reddish-fulvous; larger wing-coverts ending with reddish-fulvous; under surface white, tinged with fulvous, the feathers marked with conspicuous shaft-stripes of clear dark brown; sides and thighs of a light clear fulvous; bill dusky horn color, the end light yellow; toes brownish-yellow.

Length (skin), $14\frac{1}{2}$ inches; wing, $9\frac{1}{2}$; tail, $6\frac{1}{2}$; tarsi, $2\frac{1}{4}$.

I feel confident of being correct in referring the bird before me to *Syrnium squamulatum*, and thereby establishing its validity. By late writers, it has been considered identical with *S. virgatum*, Cass. This specimen is clearly distinct from Mr. Cassin's species, in which the coloring is much darker throughout, having the throat and breast of a dark brown, which in *S. squamulatum* are white; the light markings on the upper plumage of *S. virgatum* are rufous and in wavy lines, not, as in the other, in distinct whitish spots; the sides are dull fulvous; the thighs dark reddish-fulvous, with irregular narrow brownish bars; in *S. squamulatum* the thighs are of a very pale clear fulvous and immaculate. There are but five bars on the tail of *S. virgatum*, the other having six. The two species do not differ materially in measurements, except that the tarsi of *S. squamulatum* are much longer.

The only description I have found of this species is by Bonaparte (Cons. Av. i, p. 53), with which the specimen under examination agrees closely. Bonaparte was not acquainted with *S. virgatum*, but probably noticed in Mr. Cassin's description some similarity to that of *S. squamulatum*, as he has, *l. c.*, "*Quid Syrnium virgatum*, Cass."

218. *Pulsatrix torquata* (Daud.).

"Tehuantepec (Santa Efigenia); January, 1869.

"Iris brownish-orange; bill light greenish-horny; last scutellæ of toes ashy."

219. *Strix flammea* var. *pratincola*, Bp.

"Tehuantepec City."

Fam. FALCONIDÆ.

220. *Spizaetus manduyti* (Daud.).

"Tehuantepec (Santa Efigenia); January, 1869.

"Iris orange-yellow; cere and lorum greenish-yellow; toes yellow.

"Quite common in the large forests of the eastern coast of Mexico; it appears very rarely in the plains of the Pacific, where probably isolated individuals alone are found. This bird has the habits of the buzzards; it never leaves the woods, awaits its prey perched, and lives principally upon rats and other small quadrupeds."

221. *Spizaetus melanoleucus* (Vieill.).

"Tehuantepec (Santa Efigenia)."

222. *Pandion haliaetus* var. *carolinensis* (Linn.).

"Tehuantepec (Chihuitan); Ventosa Bay; January, 1871.

"Iris yellow; feet bluish-ash."

223. *Thrasaetus harpyia* (Linn.).

"Tehuantepec (Almoloya); October, 1868.

"Iris dark brown; cere and bill black; feet yellowish-white.

"The Harpy Eagle is exceedingly rare in Mexico, of which there is probably not a native bird; and its capture is truly a work of chance. The isolated birds which have been found there up to this time have probably been brought by some atmospheric disturbance, which has driven them beyond the natural limits of the zone in which they live."

224. *Hypotriorchis albigularis* (Daud.).

"Tehuantepec (Tapana); Oaxaca; June and August.

"Iris dark brown; bill blackish-blue; cere, lores, and orbits yellow; feet orange-yellow.

"Quite universally dispersed in the warm and temperate districts of Mexico; this falcon mounts at times up to the cold regions. It is quite rare in the dry plains which border upon the Gulf of Tehuantepec, and becomes more common as you approach the mountains. It is a resident. It mainly attacks other birds, and vigorously hunts pigeons."

225. *Hypotriorchis femoralis* (Temm.).

"Tehuantepec City."

226. *Tinnunculus sparverius* (Linn.).

"Tehuantepec City; October, 1869.

"Iris dark brown; cere, orbits, and feet yellowish."

227. *Asturina plagiata* (Licht.).

"Tehuantepec (Chihuitan, Santa Efigenia); Tehuantepec City; October to January.

"Quite common on the two coasts. It frequents thin woods, shores of rivers, and lives upon rats, birds, and insects."

228. *Rupornis magnirostris* var. *griscocauda*, Ridg., Proc. Bost. Soc. of Nat. Hist., xvi, 87.

"Tehuantepec (Chihuitan, Almoloya near Barrio, Santa Efigenia); May, October, November, and December.

"Iris bright orange-red; cere and feet yellow; bill bluish-ash; base of lower mandible greenish-yellow; feet yellow."

229. *Geranoospiza nigra* (Du Bus).

"Tehuantepec (Santa Efigenia); June, 1871.

"Iris bright red; upper mandible black, plumbeous at base, lower mandible light plumbeous; cere black; feet orange.

"Common enough on both sides of Mexico. This beautiful hawk resembles in its colors the *Urobitingas*, and by the lightness of its shape the *Micrasturs*, whose characteristics for the most part it possesses. It never leaves the woods, where, gliding with rapidity among the thickets of vines, it gives chase to the small lizards, tree-frogs, insects, &c. It is bold enough, and will allow itself to be approached carefully, but if slightly wounded it takes to flight on the ground with the greatest rapidity."

230. *Micrastur semitorquatus* (Vieill.).

"Tehuantepec (Santa Efigenia); Tehuantepec City; April, July, and November.

"Iris dark brown; bill black; cere, lores, and orbits, olive-green; feet yellow.

"This species, as one might judge at first sight from the shortness of its wings and the length of its tarsi and tail, is a very bad navigator. It is found almost always in the midst of thickets in the interior of great woods, never in exposed places. The only use he makes of his wings is to fly from one tree to another. Different from most birds of prey, who seek for their victims sometimes wheeling, sometimes perched on the top of dead trees, this one rarely leaves the shelter of the thickest foliage. It has sometimes the habit of squatting along the branches like the *Caprimulgide*. In this position, it is easily seen by the hunter. Its voice is strong and its cry analogous to that of *Herpetotheres cachinnans*; resounding for a long distance, it sounds like the syllables *kā - hǎ - ā*, *kā - hǎ - hā*, given with the full strength of its voice. A popular prejudice makes the repetition of this cry an indication of a change of weather, whence the common name of *Llama-norte* is given to *M. brachypterus*, the name which it shares on the Pacific coast with *Herp. cachinnans*. The name which they bear in common on the Atlantic coast is that of *Vaquero*.

"The food of *M. brachypterus* is composed principally of reptiles and above all of saurians. Hidden in the foliage, he waits for the young iguanas, lizards, &c. The *Cyclures* with the pointed tail (*Ctenosaura acanthura et quinquecarinata*) seem to be favorite game for him; his gizzard and his stomach almost always contain the remains. He attacks, also, young birds and insects.

"Notwithstanding the delicacy of his appearance, he is endowed with remarkable tenacity of life. It is rare that the first shot kills him outright. If, wounded in the wing, he falls to the ground, he flutters away

at so rapid a rate that a dog can scarcely follow him; and if he finds in his way a mass of dead branches, a hole, or a thicket of vines, he hides himself so well that it is difficult to find him.

"The young (of the first year?) are distinguished from the adults, not only by the plumage barred with black underneath, but also by the color of the bill. With the adults, this latter is black; with the young, it is of a greenish-olive, darker on the culmen; the cere and the lores are of a yellowish-green, and the feet of the young are of a more lively yellow. At all ages, the iris is of a reddish-brown."

231. *Herpetotheres cachinnans* (Linn.).

"Tehuantepec (Tapana); Tehuantepec City; October and December.

"Iris dark brown; bill blackish; cere yellowish; feet dull white.

"Dispersed on the two coasts of Mexico, this bird is known under the name of *Vaquero* at Vera Cruz and *Llama-norte* at Tehuantepec. It frequents with preference savannas, clearings, or the border of woods. Its large head, the custom that it has of ruffling its plumage when some object attracts its attention, and the grotesque gestures that it sometimes makes, give it a certain likeness in physiognomy to the owls. Its cry, which is very loud, is heard from a distance, and in the opinion of the natives forebodes the approach of rain or the north wind. Its food is principally composed of snakes, lizards, and grasshoppers."

232. *Accipiter fuscus* (Gm.).

"Tehuantepec (Santa Efigenia); Tehuantepec City; November and January.

"Iris reddish-orange; cere greenish-yellow; feet yellow."

233. *Accipiter cooperi*, Bp.

"Tehuantepec (Santa Efigenia)."

234. *Buteo borealis* (Gm.).

"Tehuantepec City; Cacoprieto; January, 1872.

"Iris clear yellowish-brown; cere olivaceous; bill plumbeous; tarsi clear yellowish-green."

235. *Buteo pennsylvanicus* (Wils.).

"Tehuantepec (Santa Efigenia); December, 1868.

"Iris hazel-brown; cere yellowish-green; feet yellow."

236. *Buteo pterocles* (Temm.).

"Tehuantepec (Tapana); July, 1869.

"Iris hazel-brown; cere greenish; feet yellow."

237. *Buteo minutus*, Pelz.

"Tehuantepec City; October, 1869.

"Iris brown; bill black, extreme base of both mandibles bluish; cere greenish-yellow; lores greenish; feet yellow."

238. *Antenor unicinctus* var. *harrisi* (Aud.)

"Tehuantepec City; October, 1869.

"Iris hazel-brown; cere, lores, and orbits yellow; bill light bluish-ash, tip dusky; feet orange-yellow."

239. *Urubitinga zonura* (Shaw).

"Tehuantepec (Santa Efigenia, Barrio); Tehuantepec City; Chiapas (Gineta Mountains); October to February.

"Iris brown; cere greenish-yellow; feet yellow."

240. *Urubitinga anthracina* (Licht.).

"Tehuantepec (Tapana, Santa Efigenia); December, January, February, and May.

"Iris brown; cere and lores greenish-yellow; feet yellow.

"These two species of *Urubitinga*, of habits almost analogous, are essentially river-birds, like the species of *Cymindis*; that is to say, they prefer the borders of rivers and of streams and wooded localities to all other places. In Mexico, they never leave warm and temperate latitudes, and even in the latter they are always rare. The kind of food is varied; being naturally voracious, they despise no living prey, and I have taken out of their stomachs small quadrupeds, young birds, reptiles, crustacea, and insects. They are fond of fish, and on the borders of shallow brooks they easily catch the smaller kinds. When they are at rest, their appearance is heavy and resembles that of the buzzards, but on the wing their flight is easy and graceful. On fine days, they can be seen wheeling at a great height, sometimes together, describing large circles and giving out sharp cries from time to time. On the ground, they are not wild and are easily approached. They make their nest, coarsely formed of small sticks, at the forks of the branches of the highest trees. Toward the 15th of April I have found the young, recently fledged and covered with a white down."

241. *Cymindis cayenensis* (Gm.).

"Tehuantepec (Santa Efigenia); April, 1871.

"Iris brown; upper mandible black, the lower, cere, lores, eyelids, and feet bluish-ash, the cere spotted with black.

"This bird prefers the forest for its dwelling above all other places, but it goes almost always near seas and rivers. It is evidently a resident of Central Mexico, for toward the middle of May of this year 1871) I killed a female, whose ovary contained eggs developed enough to lead one to believe that they were just ready to be laid. It gives preference to trees of the thickest foliage; it is rarely seen on naked branches. Very fond of mollusks, like others of his tribe, he hunts often on the ground and on the damp soil of forests bordering the sea, or the sides of brooks, searching for gastropods, either of land or water. From this habit, his bill, his feet, and his feathers are often much soiled."

242. *Cymindis uncinatus* (Ill.).

"Tehuantepec (Chihuitan, Santa Efigenia); January and May.

"Iris white; cere and lores green; spot below nostril and the eye yellow; feet orange-yellow.

"Notwithstanding the great difference of plumage between the old and young of this species, their identity is easily recognized, in a fresh state, by the beautiful yellow appearance of the naked skin between the eye and the bill. The habits of this species are almost identical with those of *C. cayenensis*; that is to say, that they prefer the woods in the vicinity of water. Its food is composed principally of mollusks, and I have found their stomachs almost always full of the remains of a large species of *Orthaticus*, a land gastropod very abundant in the woods of Western Mexico."

243. *Ictinia plumbea* (Gm.).

"Tehuantepec (Chimalapa); March, 1869.

"Iris brown; bill horny; feet brownish.

"It comes from Chimalapa, where, as on the coast of Vera Cruz, it is only a bird of passage. I observed a few years ago, near San Andres, Tiatla, several bands or companies of these birds traveling toward the north."

244. *Circus cyaneus* var. *hudsonius* (Linn.).

"Tehuantepec City; winter."

245. *Polyborus tharus* var. *audubonii*, Cass.

"Partout universel."

Fam. CATHARTIDÆ.

246. *Cathartes papa* (Linn.).

"Partout universel."

247. *Rhynogryphus aura* (Linn.).

"Partout universel."

248. *Catharista atrata* (Bartr.).

"Partout universel."

Fam. COLUMBIDÆ.**249. *Columba flavirostris*, Wagl.**

"Tehuantepec (Tapana); December, 1868.

"Iris reddish-orange; orbits and feet carmine; bill whitish, base rosy-red.

"Common at the foot of the Gineta Mountains, Santa Efigenia, Tapana, &c. Perches always on the highest trees."

250. *Zenaidura carolinensis* (Linn.).

"Chiapas (Gineta Mountains); January, 1869."

251. *Chamepelia passerina* (Linn.).

"Tehuantepec City; November, 1869.

"Iris light brown; bill dull carmine, tip dusky; feet light fleshy."

252. *Scardafella inca* (Less.).

"Tehuantepec City; October, 1869.

"Iris bright red; bill black; feet carmine."

253. *Melopelia leucoptera* (Linn.).

"Tehuantepec City; October, 1869.

"Iris orange; orbital skin bluish; bill black; feet dark carmine."

254. *Leptoptila albifrons*, Bp.

"Tehuantepec (Santa Efigenia); Tehuantepec City; October and January.

"Iris orange; bill black; orbital naked skin bluish; feet carmine.

"Quite common in the west of the isthmus; frequents the woods with preference; perches little, and goes almost always in pairs."

Fam. CRACIDÆ.**255. *Crax globicera* (Linn.).**

"Tehuantepec (Tapana); June, 1869.

"Iris brown; feet ashy; cere yellow.

"Known throughout Mexico under the name of pheasant. It only frequents the forests, and is seen only alone and in pairs."

256. *Penelope purpurascens*, Wagl.

"Tehuantepec (Santa Efigenia); December, 1868.

"Iris, lower part of gular skin, and acrotarsus carmine-red; upper part of gular skin, orbital, and loreal skin violaceous-black; bill black.

"Common name *Pava* at Tehuantepec, *Faison griton* or *Cajolite* at Vera Cruz. Abundant in all the thick woods of the isthmus. It goes generally in small flocks. It is good game, and the flesh is less dry and more savory than that of the Hocco. Its bones, it is said, give attacks of epilepsy to the dogs who have eaten them, and even kill them. Like the Hocco, the Pava is easily tamed."

257. *Ortalida poliocephala*, Wagl.)

"Tehuantepec (Tapana, Barrio); Tehuantepec City; April, September, and November.

"Iris hazel-brown; orbits and gular skin carmine; bill light plumbeous; feet ashy.

"This species belongs properly to the coast of the Pacific, where it bears, as elsewhere, the name of *Chachalaca*. Is abundant everywhere."

258. *Ortalida vetula*, Wagl.

"Tehuantepec (Guichicovi); September, 1869.

"Iris brown; gular naked skin carmine; bill and feet bluish-ash.

"This species is more abundant on the eastern coast of the isthmus."

Fam. PERDICIDÆ.**259. *Ortyx coyolcos*, Gm.**

"Tehuantepec (Tapana, Santa Efigenia); May, June, and December.

"Iris brown; upper mandible brownish, lower lighter; feet light brownish-gray.

"Common in all the plains on the west of the isthmus, where it is called *Codorniz*. It alights sometimes in trees when pursued."

Fam. CRYPTURIDÆ.**260. *Nothocercus sallæi*, Bp.**

"Tehuantepec (Santa Efigenia); December, 1868.

"Iris hazel-brown; upper mandible brownish, lower pale; feet red.

"Killed near Santa Efigenia. It never appears in the plains."

Fam. CHARADRIIDÆ.**261. *Edicnemus bistratus*, Wagl.**

"Tehuantepec (Tapana); December, 1868.

"Iris greenish-yellow; bill black, base of lower mandible yellowish-green; feet pale-greenish."

262. *Sqatarola helvetica* (Linn.).

"Tehuantepec (San Mateo); February, 1869.

"Iris dark brown; bill black; feet dark ashy."

263. *Egialitis vocifera* (Linn.).

"Tehuantepec (Santa Efigenia); January, 1869."

264. *Egialitis semipalmata* (Bp.).

"Tehuantepec (San Mateo); August and February.

"Iris dark brown; bill black, extreme base orange; feet dull yellowish."

265. *Egialitis collaris* (Vieill.).

"Tehuantepec City; October and November.

"Iris dark brown; bill black, extreme base of lower mandible fleshy; feet light flesh-color."

Fam. HÆMATOPIDÆ.**266. *Hæmatopus palliatus*, Temm.**

"Tehuantepec (San Mateo, San Francisco); February and April.

"Iris chrome-yellow; bill and orbits bright coral-red; feet pale flesh-color."

267. *Strepsilas interpres* (Linn.).

"Tehuantepec (San Mateo); August, 1869.

"Iris brown; bill black; feet orange-red."

Fam. RECURVIROSTRIDÆ.**268. *Himantopus nigricollis*, Vieill.**

"Tehuantepec (San Mateo); August, 1869.

"Iris carmine-red; bill black; feet light carmine."

Fam. PHALAROPIDÆ.**269. *Lobipes hyperboreus* (Linn.).**

"Tehuantepec (Ventosa); October, 1869.

"Iris dark brown; bill black; feet dark plumbeous."

Fam. SCOLOPACIDÆ.**270. *Macrorhamphus griseus* var. *scolopaceus* (Say.).**

"Tehuantepec (San Mateo); August and February, 1869.

"Iris dark brown; bill dull olivaceous, greenish at the base; feet greenish."

271. *Micropalama himantopus*, Bp.

"Tehuantepec (San Mateo); February, 1869.

"Iris brown; bill black; feet yellowish-olive."

272. *Ereunetes pusillus* var. *occidentalis*, Lawr.

"Tehuantepec (San Mateo); Tehuantepec City; August, October, and February.

"Iris dark brown; bill black; feet dark olivaceous (nearly black)."

273. *Actodromas minutilla* (Vieill.).

"Tehuantepec City; October, 1869.

"Iris dark brown; bill black, its extreme base and feet greenish."

274. *Actodromas maculata* (Vieill.).

"Tehuantepec City; October, 1869.

"Iris brown; bill blackish, dirty yellowish-green at base; feet dull yellowish-green."

275. *Calidris arenaria* (Linn.).

"Tehuantepec (San Mateo); August and February.

"Iris brown; bill black; feet dark olivaceous (nearly black)."

276. *Limosa fedoa* (Linn.).

"Tehuantepec (San Mateo); August and February.

"Iris brown; basal half of bill flesh-colored, apical half dusky; feet dark ashy."

277. *Symphemia semipalmata* (Gm.).

"Tehuantepec (San Mateo).

"Iris brown; bill blackish, at the base grayish; feet ashy."

278. *Gambetta melanoleuca* (Gm.).

"Tehuantepec (San Mateo); February, 1869.

"Iris brown; basal half of bill grayish, terminal half dusky; feet yellow."

279. *Gambetta flavipes* (Gm.).

"Tehuantepec (San Mateo); February, 1869.

"Iris brown; bill black; feet yellow."

280. *Rhyacophilus solitarius* (Wils.).

"Tehuantepec (Tapana); Tehuantepec City; October and April.

"Iris dark brown; terminal half of bill black, basal half greenish; feet light olivaceous-green."

281. *Tringoides macularius* (Linn.).

"Tehuantepec (San Mateo, Santa Efigenia); Tehuantepec City; August, October, and December."

282. *Numenius longirostris*, Wils.

"Tehuantepec (Juchitan); December, 1868.

"Iris brown; upper mandible blackish-brown, lower mandible lighter; feet ashy."

283. *Numenius hudsonicus*, Latham.

"Tehuantepec (Ventosa Bay); December, 1869.

"Iris brown; bill black, basal half of under mandible fleshy; feet ashy."

Fam. TANTALIDÆ.**284. *Tantalus loculator*, Linn.**

"Tehuantepec (Santa Efigenia); December, 1868."

285. *Ibis alba*, Linn.

"Tehuantepec (San Mateo); August, 1869.

"Iris light-blue; naked skin of face fleshy-red; bill and feet fleshy."

Fam. CANCRONIDÆ.**286. *Cancroma cochlearia*, Linn.**

"Tehuantepec (Santa Efigenia); December and January."

Fam. PLATALEIDÆ.**287. *Platalea ajaja*, Linn.**

"Tehuantepec (Santa Efigenia); February, 1869.

"Iris and feet carmine-red."

Fam. ARDEIDÆ.**288. *Ardea herodias*, Linn.**

"Tehuantepec City."

289. *Garzetta candidissima* (Gm.).

"Tehuantepec (Santa Efigenia); Oaxaca; August and December.

"Iris yellow; bill black; basal half of lower mandible light-bluish; extreme base of upper mandible and lores orange-yellow; tarsi black; toes yellow."

290. *Demiegretta leucogastra* var. *leucoprymna* (Licht.).

"Tehuantepec City; October, 1869.

"Iris straw-yellow; lores yellow; upper mandible black, lower clay-yellow; feet green."

291. *Demicregretta rufa* (Bodd.).

"Tehuantepec (San Mateo); August, 1869.

"Iris yellow; bill blackish, grayish at the base; feet black."

292. *Demicregretta pealei*, Bp.

"Tehuantepec City; October, 1869.

"Iris yellowish-white; lores light-yellow; bill fleshy, along culmen and at tip black; feet black."

293. *Florida caerulea* (Linn.).

"Tehuantepec (Santa Efigenia)."

294. *Butorides virescens* (Linn.).

"Tehuantepec (Barrio, Santa Efigenia); Tehuantepec City; October and December.

"Iris yellow; lores, orbits, and nearly all the lower mandible yellow; upper mandible brownish-black; feet olive-green."

295. *Nyctiardea grisea* var. *naevia* (Bodd.).

"Tehuantepec City; November, 1869.

"Iris red; upper mandible and tip of lower black; lores, most of lower mandible, and feet greenish."

296. *Ardetta exilis* (Gm.).

"Tehuantepec City; October, 1869.

"Iris light straw-yellow; bill yellowish, except upper surface of upper mandible, which is blackish; upper surface of tarsus and toes greenish, under surface yellow."

297. *Tigrisoma cabinisi*, Heine.

"Tehuantepec (Tapana, Chihuitan, Santa Efigenia); Tehuantepec City; Venta Salada (Puebla); April, August, October, and February.

"Iris yellow; orbits, lores, gular sac, and feet greenish; upper mandible black, lower greenish-yellow."

Fam. RALLIDÆ.**298. *Aramus scolopaceus* var. *giganteus*, Bp.**

"Tehuantepec (Santa Efigenia); February, 1869."

299. *Aramides albiventris*, Lawr.

"Tehuantepec (San Francisco); April, 1869.

"Iris reddish; basal half of bill reddish, terminal half greenish; feet carmine."

300. *Gallinula galeata*, Licht.

"Tehuantepec City ; November, 1869.

"Iris brown ; frontal plate and bill dark brownish-olive ; apical third of bill olive-green ; feet greenish."

301. *Fulica americana*, Gm.

"San Mateo."

Fam. PARDIDÆ.**302. *Parra gymnotoma*, Wagl.**

"Tehuantepec (Santa Efigenia, Zonatepec) ; March and April.

"Iris dark-brown ; bill, alar spurs, and frontal leaf bright-yellow ; upper base of bill bluish-white, the space between it and the nasal leaf dark-carmine ; feet greenish."

Fam. ANATIDÆ.**303. *Dendrocygna autumnalis* (Linn.).**

"Tehuantepec (Tapana) ; June, 1869.

"Iris brown ; bill bright-fleshy, tinged with yellow near the nostrils ; feet light-fleshy."

304. *Cairina moschata* (Linn.).

"Tehuantepec (Tapana, Santa Efigenia) ; March, May, and December.

"Iris clear chestnut-brown ; bill bluish-white, with transverse black spots ; nasal caruncle and sides of head black ; caruncles carmine-red ; feet black."

Fam. PELECANIDÆ.**305. *Pelecanus fuscus*, Linn.**

"Ventosa Bay."

306. *Pelecanus erythrorhynchus*, Gm.

"Tehuantepec (San Mateo)."

Fam. GRACULIDÆ.**307. *Graculus mexicanus*, Brandt.**

"Tehuantepec (Santa Efigenia) ; December, 1868.

"Iris green ; bill dark-fleshy ; culmen and tomia dusky ; gular sac brownish ; feet deep-black."

Fam. PLOTIDÆ.**308. *Plotus ankinga*, Linn.**

"Tehuantepec (Santa Efigenia) ; December, 1868."

Fam. TACHYPETIDÆ.**309. *Tachypetes aquilus* (Linn.).**

"Tehuantepec (Ventosa Bay); November, 1869.

"Iris dark-brown; orbits and gular skin dark-plumbeous, with a tinge of violaceous; feet carmine."

Fam. LARIDÆ.**310. *Larus delawarensis*, Ord.**

"Tehuantepec; February and March."

311. *Larus californicus*, Lawr.

"Tehuantepec (San Mateo); February, 1869.

"Iris hazel-brown; bill grayish-white, behind the yellowish-white tip a black vitta; feet dull greenish-white."

312. *Chroicocephalus atricilla* (Linn.).

"Tehuantepec (Juchitan, Ventosa, San Mateo); February, August, November, and December.

"Iris dark-brown; bill and feet reddish, tip of bill bright-red, preceded by a dusky spot or vitta; inside of mouth light-sanguine."

313. *Gelochelidon anglica* (Montagu).

"Tehuantepec (San Mateo); August and February.

"Iris dark-brown; bill black; feet brownish-black."

314. *Thalasseus maximus* (Bodd.).

"Tehuantepec (San Mateo); August and February.

"Iris dark-brown; bill bright orange-red; feet dark-brown; under surface of toes brownish-yellow."

315. *Thalasseus cantianus* (Gm.).

"Tehuantepec (San Mateo); August and February.

"Iris dark-brown; bill black, with the tip yellow; feet dark-brown, under surface of toes yellowish."

316. *Sterna forsteri*, Nutt.

"Tehuantepec (San Mateo, Ventosa Bay); December and February.

"Iris dark-brown; bill black, its extreme tip whitish; feet dark-orange."

317. *Sterna dougalli*, Mont.

"Tehuantepec (Ventosa Bay)."

318. *Sterna antillarum*, Less.

"Tehuantepec (San Mateo); August, 1869.

"Iris dark-brown; bill yellow, tip dusky; feet dull orange-yellow."

319. *Hydrochelidon fissipes* (Linn.).

"Tehuantepec (San Mateo); August, 1869.

"Iris dark-brown; bill black; feet dark-brown."

320. *Rhyaclops nigra*, Linn.

"Tehuantepec (San Mateo); August, 1869.

"Iris brown; basal half of bill coral-red, terminal half black; feet coral-red."

Fam. PODICIPIDÆ.**321. *Sylheocyclus dominicus* (Linn.).**

"Tehuantepec (Juchitan); September, 1868.

"Iris orange; bill black, tip whitish; feet black, tinged with grayish."



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Department of the Interior:

U. S. NATIONAL MUSEUM.

— 5 —

BULLETIN

OF THE

UNITED STATES NATIONAL MUSEUM.

No. 5.

PUBLISHED UNDER THE DIRECTION OF THE SMITHSONIAN INSTITUTION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

ADVERTISEMENT.

This work is the fifth of a series of papers intended to illustrate the collections of Natural History and Ethnology belonging to the United States and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

JOSEPH HENRY,

Secretary Smithsonian Institution.

SMITHSONIAN INSTITUTION,

Washington, November, 1875.

CATALOGUE

OF THE

FISHES OF THE BERMUDAS.

BASED CHIEFLY UPON THE COLLECTIONS OF THE UNITED
STATES NATIONAL MUSEUM.

By G. BROWN GOODE, M. A.

ASSISTANT CURATOR U. S. NATIONAL MUSEUM.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

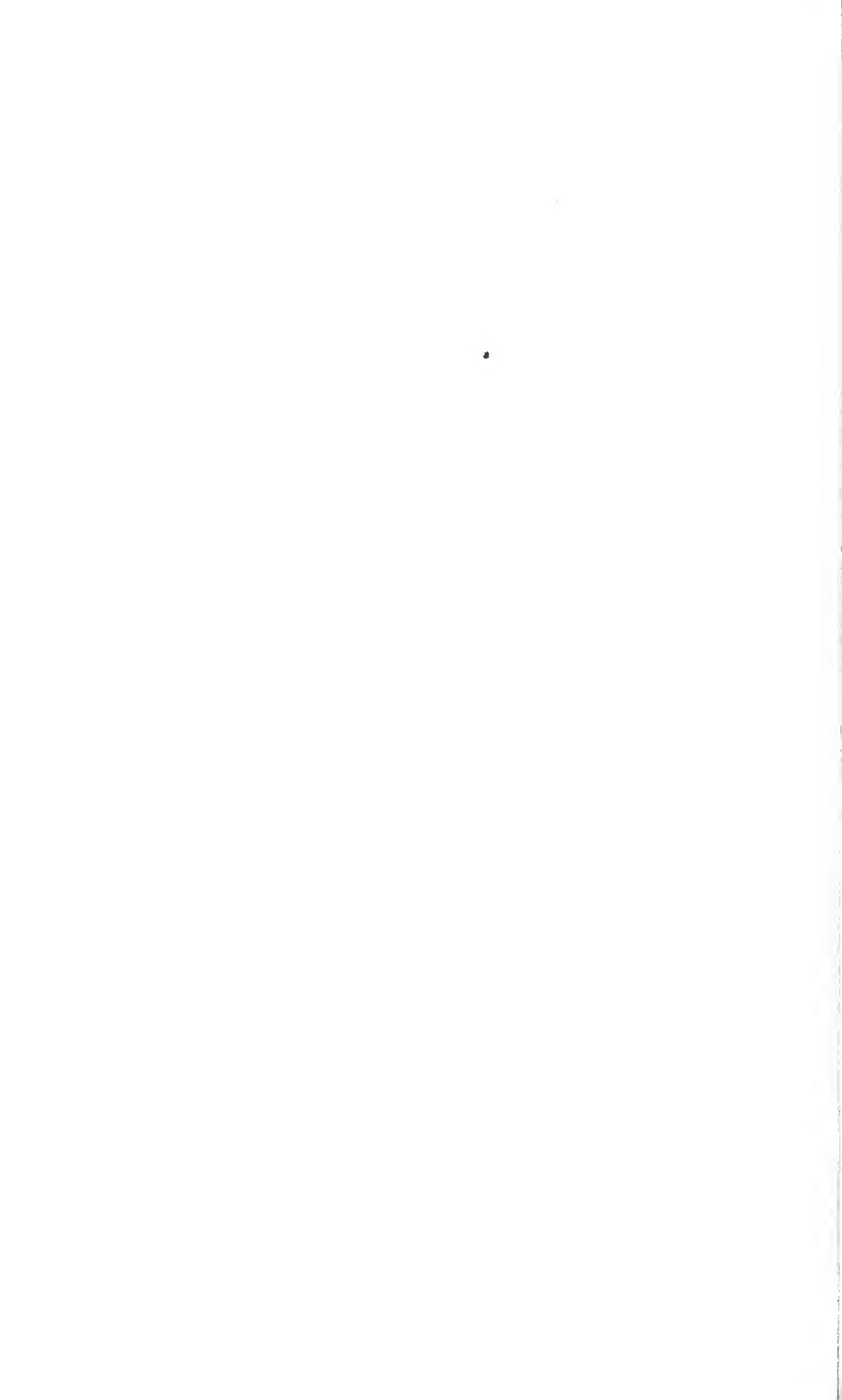
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INTRODUCTORY REMARKS.

A visit to the Bermudas during the months of February and March, 1872, afforded opportunities for collecting the notes and specimens upon which the present paper is based. The enumeration of species here attempted, although necessarily far from exhaustive, is believed to indicate, with some degree of accuracy, the character of the ichthyological fauna of the group; and it is hoped that this list, with its annotations, may not be without interest as a contribution to geographical zoology. Surprisingly little has been done by naturalists in the investigation of the marine life of this region, interesting as it is likely to prove on account of its isolated, mid-atlantic position, the peculiarities of its climate, and its proximity to the Gulf Stream, rendering so easy observations upon the influence of ocean-currents in the distribution of living forms. The ichthyologist finds here the best of opportunities for the study of pelagic and migratory species. A broad field lies before some resident naturalist who will do for the ichthyology of the Bermudas what Poey and Bleeker have done and are doing for that of the East and West Indies. Comparatively little could be done in two months, least of all in winter and early spring, when stormy weather rendered explorations of the reefs impracticable, and often prevented the fishermen from leaving their moorings in the harbors. At the time of my visit, only seven species of fishes had been recorded from this locality; and the only authentic information regarding the fish-fauna was contained in one chapter, which was unfortunately very short, of Mr. Jones's admirable little work,* the author at that time not having turned his attention to the study of this class. The list given by Godet† should

*The Naturalist in Bermuda; a sketch of the geology, zoology, and botany of that remarkable group of islands; together with meteorological observations. By John Matthew Jones, esq. (of the Middle Temple), assisted by Maj. J. W. Wedderburn (late 42nd Roy. Highlanders) and J. L. Hurdis, esq.—With a map and illustrations.—“Every kingdom, every province, should have its own monographer.”—Gilbert White. London: Reeve & Turner, 238, Strand.—1859. 12mo, pp. xii, 200.

† Bermuda, its History, Geology, Climate, Products, Agriculture, Commerce, and Government. By T. L. Godet. London, 1860. 12mo.

be ignored, as it is taken almost bodily from Gosse's "Naturalist in Jamaica."

In the present list, I enumerate seventy-five species, most of which were personally observed; for convenience of reference, all species known to occur in this locality have been included. In working up my notes, I have endeavored to supplement previous descriptions by (1) descriptions of the colors of the fishes *while living*, (2) notes on size and proportions, (3) observations on habits, (4) hints in reference to the origin and meaning of their popular names, (5) notes upon modes of capture and economic value. The meaning of the specific names employed has been defined by partial synonymies, to which critical notes are occasionally appended. To make the list a more complete contribution to chorological knowledge, a brief note has been given upon the geographical distribution of each species.

The scheme of classification proposed by Professor Gill* has been followed throughout. I am indebted to Professor Gill for valuable suggestions and the identification of two or three of the more doubtful species.

TOPOGRAPHY OF THE ISLANDS.

The general topography of the Bermudas is so well known that no detailed account will be necessary. It may not be out of place, how-

* Arrangement of the Families of Fishes or Classes Pisces, Marsipobranchii, and Leptocardii. Prepared for the Smithsonian Institution by Theodore Gill, M. D., Ph. D. Washington: published by the Smithsonian Institution, November, 1872. 8vo, pp. xlv, 50. (Smithsonian Miscellaneous Collections, 247.)

Catalogue of the Fishes of the East Coast of North America, by Theodore Gill. < Report on the Condition of the Sea Fisheries of the South Coast of New England in 1871 and 1872, by Spencer F. Baird, Commissioner, &c. pp. 779-822.

Catalogue of the Fishes of the East Coast of North America, by Theodore Gill, M. D. Ph. D. Washington. Published by the Smithsonian Institution, 1873. 8vo, pp. 50. (Smithsonian Miscellaneous Collections, 283.—A reprint of the preceding).

On the Limits of the Class of Fishes. By Theodore Gill, M. D., Ph. D. < American Naturalist, vol. vii, pp. 71-77, February, 1873. (Reprinted with repagination, 8vo, pp. 9; no title-page.)

The Number of Classes of Vertebrates and their Mutual Relations, By Prof. Theodore Gill. (Abstract of a Communication to the National Academy of Sciences, made October 29, 1873.) < American Journal of Science and Arts, vi, December, 1873, pp. 432-436. Reprinted with repagination, 8vo, pp. 4; no title-page;) also reprinted Annals and Magazine of Natural History, (London,) xiii, pp. 71-73, Jan. 1874.

Article *Fish* and descriptions of the various families, prepared by Professor Gill, as associate editor in the department of zoology, &c. < Johnson's New Universal Cyclopædia and Popular Treasury of Useful Knowledge. * * * A. J. Johnson & Son, New York.

ever, to refer to those features which bear more particularly upon the homes of the fishes. The sunken atoll, which is the foundation of the group, is shaped like an ellipse, its major axis twenty-five miles in length, its minor axis thirteen. The major axis runs in a northeast and southwest direction, the chain of main islands lying on the southeast edge of the ellipse, and forming a nearly continuous line twenty-six miles long, the lower or western end curving, nearly in the shape of a shepherd's crook or a fish-hook, to the southernmost focus of the supposed curve. The main islands, five in number, are separated by narrow channels, fifteen or twenty feet in depth, and their shores are deeply indented by shallow bays and lagoons. The reef, which approaches within a few hundred yards of the shore of the main islands on the south, is distant on the north and northwest from five to nine miles; the intervening space is crossed and recrossed by submerged reefs and ledges of coral limestone, and dotted in the neighborhood of the main islands by smaller islands and emerging ledges to the number of three hundred or more. The harbors are not particularly calm, but there are many broad bays whose surface the severest storms scarcely ripple. Within the encircling reef the depth of water rarely exceeds twelve and fourteen fathoms, while beyond this reef the bottom rapidly slopes to the level of the Atlantic bottom. Twenty miles to the southwest by west are two or three ledges, to which the fishermen resort for line-fishing in fine weather.

FISHERIES AND FISH-MARKETS.

The Bermudian fisheries have always been famous. A large number of the poorer islanders, particularly the negroes, are professional fishermen, and are bold and skillful sailors, though their ambition only suffices to keep them at work when purse and larder show signs of exhaustion. Every cottage has its little garden, where bananas and sweet-potatoes grow for the trouble of planting, so that the fishermen are not entirely dependent upon their occupation for support, and the supply of fish often falls far short of the demand, and this is especially the case in the winter, when the landing of a boat is the signal for a general rush to the shore. The people of Bermuda, over twelve thousand in number, are dependent chiefly upon the fisheries for their animal food. Large shipments of cattle and sheep are received from the United States, but these are monopolized by the wealthier classes and by the garrison, so that their flesh rarely finds its way to the tables of the negroes, who number over seven thousand, or of the poorer white colonists, who constitute more than one-half of the remaining population.

The fishing-boats are built in the English style, drawing five or six feet of water, deep-keeled, sloop or schooner rigged, and usually provided with a large well in the hold, in which the fish are brought in alive.

The only market is the water's edge. In the large towns, Hamilton and St. George's, the quay is lined nearly every morning at sunrise by a long row of fish-boats. The fish swim in the wells until customers are found for them; when one is selected, it is taken up in a landing-net or by a gaff-hook, and quickly killed by thrusting a sharp awl into the base of the brain; it is then bled, skinned (rarely scaled), eviscerated, and delivered into the hands of the purchaser, a loop of palmetto fiber always being attached for convenience in carrying. At an early hour the fares are disposed of, and the boats are under weigh for the fishing-grounds. At almost any time, however, row-boats filled with small seined fish may be found at the quay. Those who live in the country-parishes watch the return of their neighbors' boats at night-fall, and thus secure their supplies of fish.

Fish from such a market cannot fail to be fresh, and the excellence of the Bermuda food-fishes is due to this, and to the fact that they are never allowed to die of suffocation in the air, but are killed quickly and bled. The Angel-fish (*Holocanthus ciliaris*) is perhaps the most highly esteemed; next in rank are the various species of *Pristipomatidæ*, *Serranidæ*, and *Sparidæ*, with the Hog-fish (*Lachnolæmus falcatus*). All others are regarded inferior in quality. The price of fish is fixed by law at fourpence a pound, an advance of one penny having been made within a few years.

Most of the line-fishing is done among the outer reefs or on the outer banks, twenty miles distant. The favorite baits are the flesh of the "Bermuda lobster" (*Palinurus americanus*) and the "Spanish lobster" (*Scyllarus aquinoxialis*), and that of some of the larger fishes, such as the "Mackerel" (*Oreynus alliteratus*), and the Morays (*Muraenidæ*). The Pilchard (*Harengula macrophthalma*), Shad (*Eucinostomus gula* and *E. lefroyi*), and the Robin (*Decapterus punctatus*), are used as "full-baits," as are also the various kinds of "fry" (*Atherina* and *Engraulis* sp.). The "Scuttle," a large *Octopus*, very common on the reefs, is also frequently used, its toughness making it a very lasting bait. Many of the choicest and largest species, such as the *Pristipomatidæ*, *Serranidæ*, and *Scombridæ*, are taken exclusively with lines.

The *Sparidæ*, *Labridæ*, *Scaridæ*, the smaller *Serranidæ*, and many others, with great quantities of the large crustaceans so much in demand for bait, are captured in basket-work fish-pots constructed of split cane.

These are built on the same principle with the lobster-pots in use on the New England coast, but are very peculiar in shape. A fair idea of one of them may be gained by imagining two crockery-crates placed together, with the ends at an angle so as to form a very thick capital letter **V**, with arms about four feet square, the entrance being through a funnel-shaped aperture placed in the inner angle. Smaller and more portable pots, made after the same model in annealed wire, are also in use. Such pots are baited with fish or lobsters, and anchored in two or three fathoms of water.

Shallow seines, a hundred yards or so in length, are plied in the bays, and with them are taken vast numbers of the smaller school-fishes, such as *Sargus variegatus*, *Pimelopterus Boscii*, *Mugil liza*, *Eucinostomus gula*, *Eucinostomus Lefroyi*, *Hemirhamphus Pleii*, *Decapterus punctatus*, &c. These seines are usually tanned with the bark of the mangrove-tree, (*Rhizophora mangle*.)

Circular casting-nets, ten feet in diameter, are used with much dexterity in capturing small fish for bait.

The "grains," a heavy, two-pronged instrument, resembling an ordinary fish-spear or gig, is carried in every boat, and used in striking large fish. The skillful grainsman seldom misses his mark, and in these waters, clear as crystal, this instrument is effective at the depth of ten or twelve feet.

During the winter months, recourse is had to the fish-ponds, which are stocked with the surplus of the summer's catch. These are of simple construction, usually natural pools in the rocks, or protected coves, inclosed by loosely-laid stone walls. Hundreds, sometimes thousands, of large fishes are here stored up for seasons when the severity of the weather is such as to prevent the usual visits to the fishing-grounds. The largest of these, the "Devil's Hole," on Harrington Sound, is visited by almost all the strangers on the islands, a small fee being charged for the privilege of seeing the fishes feed. Several hundred large Groupers and Hamlets (*Epinephelus striatus*) are usually confined here; and, when bait is thrown into the pond, the visitor can see only a close array of widely-stretched hungry mouths, each six or eight inches in diameter.

THE RELATIONS OF THE BERMUDIAN FISH-FAUNA.

These islands, considered in reference to their marine fauna, lie on the extreme northern and eastern boundary of the West Indian "Region." All the more characteristic fishes of this "Region" are represented in Bermudian waters, and the invertebrate fauna, as far

as investigated, appears to have very similar relations. The reef-building polyps find here their farthest northern remove from the equator. That the subtropical character of the marine fauna and flora is determined to a great extent by the influence of the Gulf Stream is rendered very evident by comparing the life on the land with that of the surrounding waters. The latter is much the more tropical and West Indian in character; while the former, although many West Indian species are represented in the flora, is a curious assemblage of forms brought together from various quarters by winds, ocean-currents, and the agency of man. Drift-wood and seeds from the Antilles are cast up in great quantities with the flotsam and jetsam of the shore, and many of the commonest plants of the Bermudas are supposed to have found their way thither in this manner. Thus the transporting power of the Gulf Stream appears to have been quite as important in the introduction of tropical forms of life to this group as has been its thermal effect in rendering it a suitable home for them. Since the Bermuda atoll is comparatively recent in origin, it is not difficult to believe that it has thus been supplied with living forms. Many fishes of the West Indian fauna have been found in the waters of the Azores, Canaries, Madeira, the Cape Verde Islands, and other points in the Eastern Atlantic; it appears easy to account for their wanderings by an extension of the action of the same transporting agent.

The occurrence of several strictly European species is also to be noted. All of these appear to be powerful, rapid swimmers, with the exception, perhaps, of *Synodus lacerta*.

The subjoined tables are intended to exhibit the geographical relations of the fishes observed in Bermudian waters. Several of the species mentioned in the paper are not included, since confusion in their synonymy has rendered their limits of distribution doubtful.

The total number of species enumerated is 75. Of these, 18 are so widely distributed as to be of little importance in a comparison of this nature. Of the 57 remaining, 50, or 86 per cent. (68, or 89 per cent. of the whole number, 75), are common to the Bermudas and the West Indies; 18 species, or 32 per cent. of the whole, or 37 per cent. of those common to the two faunas compared above, occur on the coast of Brazil, only 2, however, south of Bahia; 8 species, or 14 per cent., are found on the eastern coast of the United States north of Georgia; 4 of these are undoubtedly accidental there, while 2, *Decapterus punctatus* and *Paratractus pisquetus*, have a range along the coast from Rio de Janeiro to Cape Cod, and the seventh, *Anguilla bostoniensis*, is not sufficiently

established in its specific relations to warrant generalizations; 13 species, or 23 per cent., occur in the Eastern Atlantic; 3 of these have not been recorded west of the Bermudas, and I prefer for the present to consider them as wanderers from the Mediterranean fauna. The relations, faunally, of others, such as *Balistes capriseus* and *Pimelopterus Boscii*, are somewhat problematical.

Four species of marine fishes and one inhabiting brackish water are known to be peculiar to the group.

Species common to the Bermudas and West Indies.

| | |
|----------------------------------|--|
| <i>Ostracium triquetrum.</i> | <i>Epinephelus striatus.</i> |
| <i>Pseudoscarus superbus.</i> | <i>Epinephelus guttatus.</i> |
| <i>Pseudoscarus cœruleus.</i> | <i>Hypoplectrus puella.</i> |
| <i>Chærojulis radiatus.</i> | <i>Mugil liza.</i> |
| <i>Laethokemus falcatus.</i> | <i>Auostoma coloratum.</i> |
| <i>Eucinostomus Lefroyi.</i> | <i>Hemirhamphus Pleii.</i> |
| <i>Acanthurus cœruleus.</i> | <i>Exocætus exiliens.</i> |
| <i>Sarothrodus bimaaculatus.</i> | <i>Megalops thrissoides.</i> |
| <i>Calamus megacephalus.</i> | <i>Sardinella anchovia.</i> |
| <i>Calamus orbitarius.</i> | <i>Harengula macrophthalma.</i> |
| <i>Lutjanus caxis.</i> | <i>Echidna catenata.</i> |
| <i>Mesoprion aya.</i> | <i>Zonichthys fasciatus (South Caro-</i> |
| <i>Trisotropis guttatus.</i> | <i>lina).</i> |

Common to the Bermudas, West Indies, and Eastern Atlantic.

- Chilomycterus reticulatus* (Saint Helena).
Chilichthys Spengleri (Madeira, Cape Verdes, and Western Africa).
Ostracium quadricorne (Saint Helena, Western Africa, Cape of Good Hope).
Sphyræna pieuda (river Niger).

Common to the Bermudas, Brazil, Cape Verdes, and Ascension Island.

Salarias textilis.

Common to the Bermudas, West Indies, and Northern Brazil.

| | |
|---|-------------------------------|
| <i>Malthe vespertilio.</i> | <i>Pareques punctatus.</i> |
| <i>Scarus radians.</i> | <i>Hæmylum capeuna.</i> |
| <i>Eucinostomus gula.</i> | <i>Hæmylum chrysopterum.</i> |
| <i>Hypeneus maculatus</i> (Rio de Janeiro). | <i>Trisotropis undulosus.</i> |
| <i>Holocentrum sogo.</i> | <i>Hemirhamphus Pleii.</i> |

Common to the Bermudas, West Indies, Brazil, and the Eastern Atlantic.

Labrosomus nuchipinnis (Gorea).

Harpe rufus (Saint Helena, Rio de Janeiro).

Glyphidodon saxatilis (Cape Verde Islands; accidental in New England).

Euneacentrus punctatus (Cape Verde Islands).

Gymnothorax moringa (Saint Helena).

Common to the Bermudas, West Indies, Brazil, and the east coast of the United States.

Acanthurus nigricans (South Carolina).

Decapterus punctatus.

Paratractus pisquetus.

Common to the Western Atlantic and Western Pacific??

Anguilla bostoniensis.

Common to the Bermudas, Mediterranean, and Eastern Atlantic.

Sargus variegatus (Madeira).

Synodus lacerta (Madeira).

Sphyræna spet (Canaries).

Common to the Bermudas, West Indies, Madeira, and the Mediterranean.

Pimelepterus Boscii (accidental at New York).

Common to the Bermudas, West Indies, east coast of United States, Madeira, Mediterranean, and the Pacific.

Balistes caprisæus.

Pelagic : Atlantic.

Hippocampus, sp.

Exocætus, sp.

Dactylopterus volitans (Mediterranean).

Mustelus canis.

Isuropsis punctata.

Pelagic : both hemispheres.

Paradiodon hystrix.

Coryphæna hippurus.

Alutera scripta.

* *Leptecheneis naucrates*.

Antennarius marmoratus.

* *Ptheirichthys lineatus*.

Trachurops crumenophthalmus.

Regalecus gladius.

Oreynus alliteratus.

* *Sphyrna zygaena*.

* *Naucrates ductor*.

* *Renieps tiburo*.

* Not personally observed.

Peculiar to the Bermudas.

Syngnathus Jonesii.
Lefroyia bermudensis.

Engraulis chærostomus.
Fundulus bermudæ.

Acclimated.

Carassius auratus.

POPULAR NAMES.

The names in use among the fishermen afford some curious studies. Where practicable, hints in regard to their origin have been given.

I observe that of the thirty-three names given by Catesby* as in use in the Bahamas at the time of his visit to those islands, one hundred and fifty years ago (1724-25), twenty-six are applied to common species in the Bermudas. Nearly all of these are applied to fishes of the same family or genus, and most of them to the same species. This may perhaps be explained by the common origin of the colonists of the two regions. It is an interesting instance of the persistency of common names. Many of these names are in use at the present time in the southern Atlantic States, though usually applied to different species.

Subjoined is a list of names in use among the fishermen, to the application of which I can give no clew:—

| | | |
|---------------------|---------------|-----------------|
| Glare-eye Squirrel. | Shad Porgy. | Sunburnt Shark. |
| Black Jack. | Scotch Porgy. | Rainbow. |
| Deer Grouper. | Red-tail. | Thumper. |
| Spanish Hog-fish. | Bone-fish. | Mermaid. |
| Black Hog-fish. | Grubble. | Skip-jack. |
| Clucker. | Yellow Tang. | Slippery Dick. |
| Sand-eel. | White Belly. | Prickly Hind. |
| Runner. | Blue Belly. | Sardine. |
| Blue-bone Porgy. | Permit. | Sand Mullet. |
| White-bone Porgy. | Sand Shark. | |

* The Natural History of Carolina, Florida and the Bahama Islands; containing The Figures of Birds, Beasts, Fishes, Serpents, Insects and Plants: Particularly the Forest-Trees, Shrubs and other Plants not hitherto described or very incorrectly figured by Authors. Together with their Descriptions in English and French. To which are added, Observations on the Air, Soil and Waters: With Remarks upon Agriculture, Grain, Pulse, Roots, &c. To the Whole is Prefixed a new and correct Map of the Countries Treated of. By MARK CATESBY, F. R. S. London * * * * MDCCCXXXI-XLIII. 2 vols. folio.

The English names given to the species in this paper are those which are commonly applied to them by the islanders, and no others are employed.

The following identifications of Catesby's species are suggested in connection with the plates of fishes given in the second volume. These conclusions were reached after a careful examination of the synonymy of the names here proposed as adopted by later writers, especially Linné, who appears to have founded several species upon these figures and descriptions. In many cases, comparative measurements have been made with these plates and the fishes they are supposed to represent, so as to make the identification as accurate as might be. A casual comparison will show the reader how closely the local names correspond to those in use in the Bermudas:—

- T. 1. Umbla minor, marina, &c. (BARRACUDA) is *Sphyræna picuda*.
Vulpis Bahamensis is *Albula conorhynchus*.
- T. 2. Perca marina gibbosa, &c. (THE MARGATE FISH) is (?) *Hæmylum chrysotærum*.
Saurus ex cinereo nigricans (THE SEA SPARROW HAWK) is *Synodus fætens*.
- T. 3. Perca marina, pinna dorsi divisa (THE CROKER) is *Micropogon undulatus*.
Perca marina rubra (THE SQUIRREL) is *Holocentrum sogo*.
- T. 4. Perca marina rhomboidalis (THE PORK FISH) does not agree with *Lagodon rhomboides*, to which it has been referred. The figure is too indefinite for determination and does not agree with the author's description.
Perca marina pinnis branchialibus carens (THE SCHOOLMASTER) is equally indefinite; the pectoral fins were evidently an afterthought of the artist.
- T. 5. Perca marina veneuosa, &c. (THE ROCK FISH) is *Trisotropis guttatus*, or some allied species.
- T. 6. Perca marina capite striato (THE GRUNT) is some species of *Hæmylum*, perhaps *H. arcuatum*.
Albula bahamensis (THE MULLET) is *Mugil* sp.
- T. 7. Perca marina puncticulata (THE NEGRO FISH) is *Enneacentrus ouatalibi*.
Perca canda nigra (THE BLACK-TAIL) is very like *Ocyurus chrysurus*.
- T. 8. Hirundo (THE FLYING FISH) is unidentifiable, but is probably the common Barbados species, perhaps *Eroctus Roberti*, M. & T.
Perca marina seetatrix (THE RUDDER FISH) cannot be recognized, but is probably one of the *Stromatideæ*.
Perca fluviatilis gibbosa ventre luteo (THE FRESH-WATER PEARCH) is *Pomotis vulgaris*.
- T. 9. Turdus pinnis branchialibus carens (THE MANGROVE SNAPPER) is quite unrecognizable, the grotesque figure without pectoral fins being evidently imaginary.
- T. 10. Turdus rhomboidalis (THE TANG) is *Acantharus nigricans*.
Turdus canda convexa (THE YELLOW FISH) is probably *Enneacentrus ouatalibi*.
Compare T. 7, *supra*.

- T. 11. *Turdus flavus* (THE HOG FISH) is perhaps *Harpe rufus*; is certainly a Labroid.
Turdus cinereus peltatus (THE SHAD) is a *Eucinostomus*, and closely resembles the new Bermuda species *E. Lefroyi*.
- T. 12. *Turdus oculo radiato* (THE PUDDING-WIFE) is a young specimen of *Chærojulis radiatus*.
Alburnus americanus (THE CAROLINA WHITING) is clearly *Menticirrus alburnus*, with which its shape and the barbels on the chin would place it, in spite of the manifest omission of the second dorsal fin.
- T. 13. *Mornnyrus ex cinereo nigricans* (THE BONE-FISH) I am unable to identify, though the name is in use at the present day in the Bahamas.
- T. 14. *Cugupuguacu* Brazil (THE HIND) is *Epinephelus guttatus*.
Saltatrix (SKIPJACK) is *Pomatomus saltatrix*.
- T. 15. *Snillus* (THE GREAT HOG-FISH) is *Lachnolæmus falcatus*.
- T. 16. *Aurata* Bahamensis (THE PORGY) is probably *Chrysophrys auratus* or *C. orbitalis*.
- T. 17. *Salpa purpurescens variegata* (THE LANE SNAPPER) I cannot place.
Petimbuabo Brazil (THE TOBACCOPIPE-FISH) is *Fistulari tabaccaria*.
- T. 18. *Novacula cœrulea* (THE BLUE-FISH) is *Pseudoscarus cœruleus*.
- T. 19. *Unicornis*, *Piscis Bahamensis* (THE BAHAMA UNICORN-FISH) is *Alutera scripta*.
- T. 20. *Muraena maculatus, nigra et viridis* (THE MURAY) closely resembles *Gymnothorax rostratus*.
- T. 21. *Muraena maculata nigra* (THE BLACK MURAY) is not clearly identified.
- T. 22. *Turdus oculo radiato* (THE OLD WIFE) is *Balistes vetula*.
- T. 23. *Bagre*, &c. (THE CAT-FISH) somewhat resembles *Noturus flarus*.
- T. 24. *Harengus minor Bahamensis* (THE PILCHARD) is some small Clupeoid.
- T. 25. *Anthea quartus, Rondeletii* (THE MUTTON-FISH) is a *Lutjanus*, perhaps *L. aya* or some allied form.
- T. 26. *Remora* (THE SUCKING FISH) belongs of course to *Echeneididae*, though lack of detail will not allow even generic identification.
- T. 27. *Solea lunata et punctata* (THE SOLE) I do not know.
- T. 28. *Orbis lævis variegatus* (THE GLOBE FISH) is *Chilichthys turgidus*.
- T. 29. *Psittacus piscis viridis, Bahamensis* (THE PARROT FISH) is *Pseudoscarus Catesbyi*.
- T. 30. *Acus maximus squammosa viridis* (THE GREEN GAR-FISH) is *Lepidosteus ossesus*.
- T. 31. *Acarauna major pinnis cornutis* (THE ANGEL FISH) is *Holacanthus ciliaris*.

FISHES OF THE BERMUDA ISLANDS.

LIST OF SPECIES.

MALTHEIDÆ.

MALTHE VESPERTILIO, (Linn.) Cuv., subspecies VESPERTILIO.

DEVIL-FISH.

Lophius fronte unicorni, LINNÉ, Mus. Ad. Fried. 1, 1754, 55.—ARTEDI, Syn. Pisc. 1788, 88.

Guaperra, BROWN, Hist. Jamaica, 1756, 457, pl. 48, f. 3.

Rana piscatrix americana, SEBA, Locup. Rer. Nat. Thes. Desc. 1, 1758, 118, tab. lxxiv, f. 2.

Lophius vespertilio, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 236, ed. 12, 1, 1766, 402.—GMELIN, Linn. Syst. Nat. 1, 1788, 480 (*partim*).—BLOCH, Ichth. iv, 1787, 8, taf. ex. (on a drawing by Plumier).—SCHNEIDER, Bloch, Syst. Ichth. 1801, 140.—LACÉPÈDE, Hist. Nat. Poiss. 1, 1798, 302-315.

Malthe vespertilio, CUVIER, Règne Anim. 1817.—MÜLLER & TROSCHEL in Schomburgk, Hist. Barbados, 1848, 678.—GÜNTHER, Cat. Fish. Brit. Mus. iii, 1861, 200 (*partim*).—POEY, Mem. ii, 1861, 382; Rep. Fis.-Nat. Cuba, ii, 1868, 406.—COPE, Trans. Am. Phil. Soc. 1870, 480.—GILL in Baird's Rep. Sea Fisheries of New England, 1873, 792.

Malthea vespertilio, CUV. & VAL., Hist. Nat. Poiss. xii, 1837, 440.—STORER, Syn. Fish. N. Amer. 1846, 131.—GILL, Cat. Fish. E. Coast N. Amer. 1861, 47.—LÜTKEN, Nat. Foren. Vid. Med. 1865, 5.

Malthæa vespertilio, DEKAY, New York Fauna, Fish, 1842, 452.

A single specimen of this species was noticed in the collection of Mr. John T. Bartram, of Stocks Point, Saint George's Island. It is recorded from various points in the West Indies. Dr. Günther has united all described species, except *Malthe cubifrons*, Richardson, under the name *Malthe vespertilio*. The species thus limited is very variable in respect to the length of snout, which in some individuals equals one-sixth of the entire length of the fish, in others reduced to one-twentieth or one twenty-fifth. Professor Lütken recognizes three species within these limits; *Malthe vespertilio*, represented by the synonymy given above;

Malthe longirostris, Cuv. & Val., the Guaneuja of Marcgrave;* and *Malthe notata*, Cuv. & Val. These species seem to correspond with certain limits of variation, and are probably entitled to subspecific rank, particularly since these limits of variation are correlated with their geographical distribution. The form designated as *vespertilio* corresponds to section (δ) of Günther, having the snout one-ninth or one-tenth of the total length, and is recorded from Cuba, Jamaica, Santo Domingo, Porto Rico, and Martinique.

M. longirostris corresponds to section (α) of Günther, having the snout one-sixth of the total length, and is recorded from Bahia and Para.

M. notata was described from Surinam, and, according to Dr. Günther, from young specimens. Dr. Günther identifies it with a Demerara specimen, and refers it to section (ε), having the snout one-thirteenth of the total length.

M. angusta, corresponding to section (η) of Günther, with the snout one-twentieth to one twenty-fifth of the total length, represents the minimum development of snout, and is known from Brazil.

Malthe cubifrons, Richardson, is undoubtedly entitled to full specific rank.

ANTENNARIIDÆ.

PTEROPHYRNE PICTA, (Val.) Goode.

DEVIL-FISH; MARBLED ANGLER.

Lophius histrio, var. *b. pictus*, SCHNEIDER, Bloch, Syst. Ichth. 1801, 124.

Chironectes pictus, CUV. & VAL., Hist. Nat. Poiss. xii, 293, pl. 364.

Antennarius marmoratus, var. *a. picta*, GÜNTHER, Cat. Fish. Brit. Mus. iii, 1861, 186.

A single specimen was given me by C. C. Keane, esq., of Hamilton, and I saw several others. The fish is pelagic, occurring only in the warmer parts of the Atlantic. Its home is among the floating masses of Gulf-weed (*Sargassum bacciferum*). It is often brought ashore in the beds of this alga, which is thrown up among the rocks in great heaps after the winter storms. I have seen its curious nest, consisting of a bunch of eggs adhering in glutinous masses to the *Sargassum*, the whole cluster large enough to fill a quart measure. One of these was thrown ashore in February, and is now in the collection of J. Matthew Jones, esq., of Halifax, Nova Scotia.

* Historia Naturalis Brasiliæ, 1648, p. 143.

DIODONTIDÆ.

PARADIODON HYSTRIX, (Linné) Bleeker.

SEA HEDGEHOG; SEA PORCUPINE.

Guamajacu Guara, MARCGRAVE, Hist. &c. Brazil. 1648, 158.

Diodon Hystrix, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 335; ed. 12, 1, 1766, 413 (not Gmelin) Linné, Syst. Nat. 1, 1788, 449, according to BARNEVILLE, Revue zoologique 1846, 141).—POEY, Mem. ii, 1861, 361.—GÜNTHER, Cat. Fish. Brit. Mus., viii, 1870, 306.—COPE, Trans. Am. Phil. Soc. 1870, 480.

Paradiodon hystrix, BLEEKER, Atl. Ichth. v, 1865, tab. ccvii, f. 2.—POEY, Rep. Fis. Nat. Cuba, ii, 1868, 430.

Erizo, PARRA, Desc. Dif. Piez. Hist. Nat. Cuba, 1787, 60, lam. xxix, f. 1-2.

Diodon atinga, BLOCH, Ichth. iv, 1787, 75, taf. cxxv, (not Linné).—GMELIN, Linné, Syst. Nat. 1, 1788, 1449.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 511.—LACÉPÈDE, Hist. Nat. Poiss. ii, 1801, 1-3.—SHAW, Gen. Zool. v, 1804, 434.—MÜLL. & TROSCH. in Schomburgk, Hist. Barbados, 1848, 677.—KAUP, Wiegmann's Arch. Naturg. xxi, 1855, 227.—JOUAN, Anim. Nouv. Caledonie, Mem. Soc. Imp. Sci. Nat. Cherbourg, 1861-'63, 18.—BLEEKER, Enum. Pisc. Arch. Ind. 1859, 203.

Diodon attinga, RUPPELL, Verzeichn. Senckenb. Mus. Fisch. 18 2, 35.

Diodon Plumieri, LACÉPÈDE, op. cit. ii, 1, 1801, 1-10, pl. iii, f. 3.

Diodon Brachiatus, SCHNEIDER, op. cit. 213 (founded on Parra's figure No. 1, cited above.)

Diodon punctatus, CUVIER, Mem. Mus. Hist. Nat. iv, 1818, 132, and Règne Animal, 1817, p.—BLEEKER, Verhandl. Bat. Gen. xxiv, Blootk. Vissch. 1852, 19.

This species, common in the West Indies, recorded also from the Pacific and the Indian Archipelago, is occasionally found here, and, on account of its bristly skin, is greatly prized by curiosity-hunters. It is never eaten. I saw four specimens, each about eighteen inches long.

CHILOMYCTERUS RETICULATUS, (Linn.) Bibron.

Orbis muricatus et reticulatus, WILLUGHBY, Ichthyographia, 1685, 155, tab. J, No. vii.—SEBA, Locup. Rer. Nat. Thes. Desc. iii, 1758, 58, tab. xxiii, f. 3.

Ostracion subrotundus, aculeis undique brevibus triquetris raris, ARTEDI, Gen. Pisc. 1738, 52, No. 16.

Diodon reticulatus, LINNÉ, Syst. Nat. 1, 1758, 334.—GMELIN, Linné, Syst. Nat. 1, 1788, 1449.

Chilomycterus reticulatus, BIBRON *apud* BARNEVILLE, Revue Zoologique, 1846, 141.—BLEEKER, Atl. Ichth. v, 1865, 54.—GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 313.

Diodon atringa β, LINNÉ, op. cit. ed. 12, 1, 1766, 413.

† *Diodon atinga*, POEY, Mem. ii, 1861, 361; Rep. Fis. Nat. Cuba, ii, 1868, 429.—COPE, Trans. Am. Phil. Soc. 1870, 480.

Dr. Günther records a single specimen from the Bermudas. Another, in the University Museum at Middletown, Connecticut, is said to have come from the same locality.

Additional data are necessary in order to determine the true relations of Linné's *Diodon atringa* (*atinga*). Barneville and Bleeker consider it identical with *Diodon orbicularis* of Bloch. Günther does not commit himself decidedly, although he cites, under *Chilomycterus geometricus*, Maregrave's *Gnamajacu atinga*, upon which the species of Linné is presumably founded. The relations of the species *D. atinga* are important as throwing light upon the relations of the genus *Diodon*, of which it must be considered the type; there can be little doubt, however, that Bleeker is right in retaining in this genus those forms which have three rather than two roots to their spines.

TETRODONTIDÆ.

CHILICHTHYS SPENGLERI, (*Bloch*) *Goode*.

SWALLOW; PUFF-FISH.

Tetrodon Spengleri, BLOCH, Ichth. iv, 1787, 134, taf. cxliv.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 504.—LACÉPÈDE, Hist. Nat. Poiss. i, 1798, 476-501.—SHAW, Gen. Zool. v, 1804, 445.—GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 284.—COPE, Trans. Am. Phil. Soc. 1870, 479.

Tetrodon Plumieri, LACÉPÈDE, op. cit. 476-504, pl. xx, f. 3 (on a drawing by Plumier).

Tetrodon marmoratus, RANZANI, Nov. Comm. Acad. Bonon. iv, 1810, 72, pl. x, f. 1.—LOWE, Trans. Zool. Soc. ii, 1841, 193.—VALENCIENNES in Webb and Berthelot, Hist. Nat. Canaries, Poiss. 1836, pl. xx, f. 2.

A single specimen of two inches was found on the beach at Bayley's Bay. The species ranges from Madeira and Northwestern Africa to the Caribbean, and no doubt frequently occurs about the Bermudas. Bloch, in his description, figures the species with the imperforate nasal tentacles of the genus *Arothron*, giving the East Indies as its habitat. Making due allowances for the notorious carelessness of early ichthyologists in fixing the localities of specimens, and for the lack of detail in their drawings, we believe that the present name should be retained, since the fish figured by Bloch is unmistakably the one before us. Should time render it necessary to adopt another name, that of Ranzani, who described the species accurately, may be substituted.*

Color.—Above, light chestnut; beneath, clear white; a lateral band

* *Tetrodon marmoratus*, RANZANI, Novi Commentarii Acad. Sci. Inst. Bonon. iv, 1810, p. 72, pl. x, fig. 1.

of tawny white, from chin to base of caudal rays, where it is confluent with a ring of the same color around the extremity of the caudal peduncle; beneath this lateral band a row of brown spots, of irregular size and fifteen in number, three being on the caudal peduncle; above a similar row, often very obscure. Caudal brown, with broad, median transverse band of yellow; other fins immaculate.

When inflated with air, the diameter of the belly is considerably greater than half the entire length of the fish.

Its habits are doubtless very similar to those of *Chilichthys turgidus* (Mitch.) Gill, common on the east coast of North America from Cape Cod to the Antilles, which it much resembles, and which is very likely to occur in the Bermuda waters.

OSTRACIIDÆ.

OSTRACIUM TRIQUETRUM, Linn.

CUCKOLD.

Ostracion triangulus, tuberculis, exiguis numeris aculeis carens, ARTEDI, Gen. Pisc. 1738, 57; Syn. Pisc. 1738, 85.

Ostracion polyodon inermis triqueter, LINNÉ, Mus. Ad. Fried. 1, 1754, 60.

Ostracion triqueter, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 330; ed. 12, 1, 1766, 407.—BLOCH, Ichth. iv, 1787, 106, taf. cxxx.—GMELIN, Linné, Syst. Nat. 1, 1788, 1441.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 498.—LACÉPÈDE, Hist. Nat. Poiss. 1, 444.—SHAW, Gen. Zool. v, 1804, 420.—MÜLL. & TROSCH. in Schomburgk, Hist. Barbados, 1848, 677.—HOLLARD, Ann. Sci. Nat. 1857, 154.—GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 256.

Ostracion triquetrum, POEY, Mem. ii, 1861, 361; Rep. Fis.-Nat. Cuba, ii, 1868, 442.

Ostracium triquetrum, COPE, Trans. Am. Phil. Soc. 1870, 475.

Rhinesomus triqueter, SWAINSON, Nat. Hist. Fish. & Rept. ii, 1839, 324.

Common, as it also is throughout the West Indies and the Gulf of Mexico. Its length seldom exceeds eight inches. Its habits are sluggish, and it hugs very closely the bottom, where it is frequently taken in fish-pots.

The locomotion of the trunk-fishes is very peculiar, and I found an excellent opportunity for observing the movements of a Cuckold confined in my aquarium. The propelling force is exerted by the dorsal and anal fins, which have a half-rotary, sculling motion resembling that of a screw-propeller; the caudal fin acts as a rudder, save when it is needed for unusually rapid swimming, when it is used as by other fishes. The chief function of the broad pectorals appears to be that of fanning a

current of water through the gills, thus aiding respiration, which would otherwise be difficult on account of the narrowness and inflexibility of the branchial apertures.

When taken from the water, one of these fishes will live for two or three hours, all the time solemnly fanning its gills, and when restored to its native element seems none the worse for its experiences, except that, on account of the air absorbed, it cannot at once sink to the bottom. The Cuckold is not valued for food, though I am unable to learn that its use is ever followed by fatal results such as attend it in some of the West Indies.*

The local name is not applicable, and has probably been transferred from some other fish, as, for instance, the following species, which is known in Jamaica as "the cuckold."

Color.—Dark brown, thickly studded with circular spots of yellowish-white, each about two lines in diameter. The epidermis is often abraded, leaving the shell uniform tawny-white.

OSTRACIUM QUADRICORNE, Linné.

COW-FISH.

Piscis triangularis cornutus Clusii, WILLUGHBY, Hist. Pisc. 1686, xiv, tab. J.

Ostracion triangularis 2 aculeis &c., ARTEDI, Syn. Pisc. 1738, 85, No. 9.

Ostracion quadricornis, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 331; ed. 12, 1, 1766, 408.—BLOCH, Ichth iv, 1787, 113, taf. cxxxiv.—GMELIN, Linné, Syst. Nat. 1, 1788, 1442.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 499.—LACÉPÈDE, Hist. Nat. Poiss. 1, 1798, 442, 468.—SHAW, Gen. Zool. v, 1804, 424.—KAUP, Wiegmann's Arch. Naturg. xxi, 1855, 218.—HOLLARD, Ann. Sci. Nat. 1857, 148.—BLEEKER, Poiss. Guinea, 1863, 20.—GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 258.

Ostracion quadricorne, POEY, Mem. ii, 1861, 362; Rep. Fis.-Nat. Cuba, ii, 1863, 439.

Ostracion (Acanthostracion) quadricornis, BLEEKER, Atl. Ichth. 1865, 32.

Ostracium quadricorne, COPE, Trans. Am. Phil. Soc. 1870, 474.

Lætophrys quadricornis, SWAINSON, Hist. Nat. Fish. & Rept. ii, 1839, 324.

Chopin, PARRA, Desc. Dif. Piez. Hist. Nat. Cuba, 1787, 31, lam. xvii.

Ostracion Lister, LACÉPÈDE, op. cit. 468, pl. xxiii, f. 2.

Ostracion sexcornutus, MITCHILL, Amer. Month. Mag. ii, 1818, 328.

Lactophrys sexcornutus, STORER, Syn. Fish. N. Am. 1846, 246.

Ostracion cornutus, MÜLL. & TROSCHE, in Schomburgk, Hist. Barbados, 1848, 677 (not Linné or Bloch).

Ostracion maculatus, HOLLARD, op. cit. 149.

Common; its habits much like those of *Ostracium triquetrum*. Its range is much wider, including Saint Helena, Guinea, the Cape of

* Schomburgk, History of Barbados, p. 677.

Good Hope, and Charleston, S. C. Its occurrence in the Indian Archipelago is extremely doubtful, as Bleeker himself admits. This species is extremely variable, in length, breadth, and height of body, length of tail, and length of caudal, and these variations seem to be individual as well as related to age. Hollard's *Ostracion maculatus* * and the various *species dubia* of Poey† will probably prove to be forms of this species.

The presence of plates upon the caudal peduncle is apparently accidental. They may possibly have some relation to sex, but certainly none to age. Out of fourteen specimens examined, five had plates above and below, one had two above, and six had none. In none of the specimens can I distinguish traces of the spine in the middle of the dorsal ridge mentioned by Dr. Günther. The color of young specimens is well described by Günther; the bands on the cheek are, however, of a bright blue. Adult specimens are colored in a rich bright blue, which quickly vanishes after death. In some individuals, the color is worn from the ridges of the carapace, leaving patches of light brown. The largest specimens are twenty-one inches long.

The Cow-fish is, I was told, much esteemed for food, and is frequently baked whole in its shell. The popular name, like the Cuban "*toro*" and the Jamaican "euckold," refers to the two horn-like supra-orbital spines.

BALISTIDÆ.

BALISTES CAPRISCUS, *Gmelin*.

TURBOT.

Balistes capriscus, GMELIN, Linné, Syst. Nat. 1, 1788, 1471.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 476.—LACÉPÈDE, Hist. Nat. Poiss. 1798, 1, 372, pl. xiii, f. 3.—SHAW, Gen. Zool. v, 1804, 411.—RISSE, Ichth. Nice, 1810, 51.—YARRELL, Brit. Fish. ii, 1841, 472.—HOLLARD, Ann. Sci. Nat. 1854, 309.—GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 217.—GILL, in Baird's Rep. on Sea Fisheries of Southern New England, 1873, 793.

Balistes fuliginosus, DEKAY, New York Fauna, Fishes, 1842, 339, pl. lvii, f. 183.—STORER, Syn. Fish. N. Am. 1846, 243.

Capriscus fuliginosus, GILL, Cat. Fish. E. Coast N. Am. 1861, 56.

Common. Very erratic in its distribution, having been observed in the Pacific at Panama, at Madeira, in the Mediterranean, and on the coast of Great Britain. DeKay figures a specimen taken in New York Harbor; the

*Annales des Sciences Naturelles, vii, p. 148.

†Repertorio Físico-Natural de la Isla de Cuba, ii, pp. 439-440.

United States National Museum has specimens from Wood's Hole, Mass., Charleston, S. C., and the Tortugas; it is not recorded from the West Indies. The Turbot attains a weight of five or six pounds; its flesh is not unpalatable, and its tough, shagreen-like skin is used for polishing purposes. It has a habit of swimming on its side, just at the surface, like the Sunfish (*Mola rotunda*), and, from this habit as well as perhaps a fancied similarity of its form to that of the European Turbot (*Rhombus maximus*), its name appears to have been derived. It no doubt breeds in these waters; I have seen young individuals not exceeding three inches in length. The species should be compared with *Balistes sobaco*, Poey. No other species of this subfamily were observed.

I suppose the "Old-wife," "Ocean-turbot," and "Black-turbot" of the fishermen to correspond respectively to *Balistes retula*, Linné, *Canthidermis maculatus*, (Gmelin) Bleeker, and *Melichthys buniva* (Lacépède), all of which, as well as *Balistes ringens*, Linné, are quite certain to occur in these waters.

ALUTERA SCRIPTA, (Osbeck) Bleeker.

Unicornis Piscis Bahamensis, CATESBY, Nat. Hist. Carol. Florida, and the Bahama Islands, ii, 1743, 19, tab. 19.

Balistes scriptus, OSBECK, Iter. Sin. 1765, 144.—GMELIN, Linné, Syst. Nat. 1, 1788, 1463.

Aluteres scriptus, BLEEKER, Ned. Tyds. Dierk. iii, 1865, 28; Ichth. 1865, 141, tab. cexxvii, 4.

Monacanthus scriptus, GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 252.

Lija Trompa, PARRA, Desc. Dif. Piez. Hist. Nat. Cuba, 1787, 46, lam. xxii, f. 1.

Balistes Lavis, BLOCH, Ichth. xii, 1797, 63, tab. cccxiv.—SHAW, Gen. Zool. v. 1804, 405.

Aluteries lavis, CUVIER, Règne Animal, 1817.—CANTOR, Cat. Malayan Fish. 355.—BLEEKER, Verhandl. Batav. Gen. xxiv (Balistidae), 21.—HOLLARD, Ann. Sci. Nat. 1855, 15.—DAY, Fish. Malabar, 1865, 355.

Alutera lavis, SWAINSON, Nat. Hist. Fish. & Rept. ii, 1839, 327.

Aluteres lavis, RICHARDSON, Voy. II. M. S. Sulphur, 1845, 131, pl. lxi, f. 3.

Balistes Monoceros, var. *Lavis*, SCHNEIDER, Bloch, Syst. Ichth. 1801, 463.

Balistes ornatus, PROCÉ, Bull. Philom. 1822, 131.

Aluteres parva, LESSON, Voy. Coquille, ii, 1830, 106.

Aluteres venosus, HOLLARD, op. cit. 14, pl. 1, f. 3.

Alutera picturata, POEY, Proc. Acad. Nat. Sci. Phila. 1863, 183; Rep. Fis.-Nat. Cuba, ii, 438.

Aluteres picturatus, COPE, Trans. Am. Phil. Soc., 1870, 476.

A specimen twenty-one inches long was taken off the islands in April, 1872. The occurrence of the species is so unusual that it has no common name. It appears to be strictly pelagic, and is recorded from China, the Indian Archipelago, Tahiti, New Ireland, Coromandel, the Canaries, the West Indies, Brazil, and South Carolina.

HIPPOCAMPIDÆ.

HIPPOCAMPUS, *sp.*

SEA-HORSE.

Two specimens, apparently of different species, were secured; but, owing to the unsatisfactory nature of the published descriptions, it is impossible at present to identify them. One agrees tolerably with *H. antiquorum*, Leach.

SYNGNATHIDÆ.

SYNGNATHUS JONESII, *Günther.*

Syngnathus Jonesii, GÜNTHER, Ann. & Mag. of Nat. Hist. 1874.

This species was deservedly dedicated to J. Matthew Jones, esq., F. L. S., who is doing so much toward elucidating the natural history of these islands. Pipe-fishes are not uncommon. *S. pelagicus*, Osbeck, is likely also to occur.

AULOSTOMIDÆ.

AULOSTOMA MACULATUM, *Valenciennes.*

TRUMPET-FISH.

Trompetero colorado, PARRA, Descr. Dif. Piez. Hist. Nat. Cuba, 1787, 63, lam. xxx, f. 2.

Aulostoma maculatus, VALENCIENNES in Cuvier, Règne Animal, 1817; ill. ed. Poiss. 1829, pl. xcii, f. 2.

Aulostoma coloratum, MÜLL. & TROSCHE in Schomburgk's Hist. Barbados, 1848, 173.—GÜNTHER, Cat. Fish Brit. Mus. iii, 1861, 536.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 386.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 480.

A dried head of this species was shown me by C. C. Keane, esq., of Hamilton. The fishermen speak of two Trumpet-fishes found here, one of them designated the Black Trumpet-fish. One of these is probably *Fistularia tabaccaria*, Liuné. Mr. J. Matthew Jones informs me of the capture, in 1874, of a specimen of *Fistularia serrata*, Cuv., hitherto known only from the Indian and Pacific Oceans.

FIERASFERIDÆ.

LEFROYIABERMUDENSIS, *Jones.*

Lefroyia Bermudensis, JONES, Zoologist, Jan., 1874, 3838.

A single specimen four and one-half inches long was taken by Governor Lefroy in the summer of 1873.

"Total length rather more than 4½ inches. Greatest depth at the ver-

tical of the pectorals, three lines and one-half. The length of the head is slightly more than one-seventh of the total length. The greatest width of the head is rather less than one-third of its length. Body naked, attenuate, compressed. Facial outline rugose. Eye moderate; horizontal diameter of the eye-cup, one and three-quarter lines; vertical diameter, one and one-quarter lines. Gape of mouth wide. Lower jaw shorter, and received within the upper. Cardiform teeth of irregular size in both jaws, vomer, and palatines; those of the latter largest. Branchiostegals seven, inflated, united below. Vent thoracic. Pectorals originating at the upper angle of the operculum, three lines in extent, of delicate soft rays. Dorsal indistinct, commencing in a groove at about the vertical of the twentieth anal ray, continuous to caudal extreme; when in conjunction with the anal, it forms a small filamentous tip. Anal prominent, commencing immediately behind the vent, in advance of the vertical to the upper angles of the operculum, and extending to the caudal extreme. About its centre, it is equal in depth to that of the body at the same position. Owing to the delicate texture of the fins, it is impossible to determine the number of rays, but those of the anal exceed one hundred and forty. Color when dried, out of spirit, golden-yellow. The body transparent, showing the vertebra within, a condition, according to General Lefroy, equally observable in life."—*Jones.*

The genus proposed by Mr. Jones has not yet been defined, and the name *Lefroyia* can be adopted only provisionally.

BLENNIIDÆ.

LABROSOMUS NUCHIPINNIS, (*Quoy & Gaimard*) *Poey.*

MOLLY MILLER.

Clinus nuchipinnis, QUOY & GAIMARD, Voy. Uranie et Physicienne, Zool. 1824, 255.—

GÜNTHER, Cat. Fish. Brit. Mus. iii, 1861, 262.

Labrosomus nuchipinnis, POEY, Rep. Fis.-Nat. Cuba, ii, 1863, 308.

Clinus pectinifer, CUV. & VAL., Hist. Nat. Poiss. xi, 1836, 374 (female).—MÜLL. & TROSCHE in Schomburgk's Hist. Barbados, 1848, 671.—CASTELNAU, Anim. Nouv. &c. Amérique du Sud, 1855, Poiss. 26.

Labrisomus pectinifer, SWAINSON, Nat. Hist. Fishes &c. 1839, 277.—COPE, Trans. Am. Phil. Soc. 1870, 473.

Labrosomus pectinifer, GILL, Proc. Acad. Nat. Sci. Phila. 1860, 105.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 381.

Clinus capillatus, CUV. & VAL., op. cit. 377 (male).—MÜLL. & TROSCHE, l. c.

Labrisomus capillatus, SWAINSON, l. c.

Labrosomus capillatus, GILL, op. cit. 107.—POEY, l. c.

Lepisoma cirrhosum, DEKAY, New York Fauna, Fishes, 1842, 41, pl. xxx, f. 94.—STORER, Syn. Fish. N. Am. 49.

Very common under stones in tide-pools and in crevices; their habits closely resembling those of the "Rock-eel" (*Muraenoides mucronatus*), so familiar to naturalists on the New England coast. Some individuals are brilliantly colored with red beneath, while others are gray. These differences are most probably sexual. My largest specimens are four inches long. The species is recorded from the Antilles, Bahia, Gorea, and the National Museum has specimens from Florida.

SALARIAS TEXTILIS, Q. & G.

Salarias textilis, QUOY & GAIMARD, MS.—CUVIER & VALENCIENNES, Hist. Nat. Poiss. xi, 307.

? *Salarias vomerinus*, CUV. & VAL., op. cit. 349.

Salarias vomerinus (CUV. & VAL. ?) JENYNS, Zool. Voy. H. M. S. Beagle, Fishes, 1842, 88, pl. 17, f. 3.

This species, found in tide-pools in company with the preceding, appears to be identical with that brought by Quoy and Gaimard from the Isle of Ascension. The measurements do not agree precisely with those given by Valenciennes (which are expressed in very general terms); its colors, however, are precisely the same. It agrees in many points with the specimens collected by Darwin at Porto Praya, and provisionally referred by Jenyns to *Salarias vomerinus*, C. & V.

The Bermuda specimens have the vomerine teeth and the four ventral rays, the omission of which in the description of *Salarias textilis* was Jenyns's chief reason for not referring the Cape Verde specimens to that species. The affinities of *S. textilis* and *S. vomerinus*, always considered close, have some light thrown upon them by the discovery of vomerine teeth in the former. The question of their identity, however probable it may seem, must be decided by the comparison of a larger series of specimens. Such study will probably result in the establishment of a new genus for the reception of the species at present referred to *Salarias*, which possess vomerine teeth.

A detailed description of the Bermuda specimens is given for convenience in future comparisons. The greatest height of the body, at the beginning of the dorsal, is slightly less than one-sixth (0.16) of the extreme length, and is four-fifths of the length of the head; the height of the lowest part of the caudal peduncle equals one-half the greatest height of the body (0.08). The head measures one-fifth (0.20) of total

length. The eye is slightly elliptical, and its longitudinal diameter equals the length of the snout, or one twenty-fifth (0.04) of the total length. The interorbital space equals half the diameter of the orbit, and is concave. The profile is very obtuse, and the eye is situated just within the angle formed by profile and crown. There are two broadly-palmated superciliary filaments, not so long as the diameter of the orbit; two similar but smaller ones at the nostrils; also two short filaments, one on either side of the nape. The lips are crenated at the sides of the mouth, though not anteriorly. In addition to the row of numerous small movable teeth common to all the species of the genus, there is a long recurved canine tooth on each side of the lower jaw, behind the series of small teeth; also, a transverse row of minute teeth on the anterior portion of the vomer.

The dorsal fin originates just behind the nuchal filaments, at a distance from the snout (0.22) slightly greater than the length of the head; its spinous portion nearly equals its soft portion, the former measuring 0.30, the latter 0.31. A deep notch almost separates the two parts.

The anal fin originates at a distance from the snout equal to one-half the length of the body exclusive of the caudal (0.42). Its first ray measures 0.07, its penultimate ray 0.12, its ultimate ray 0.05. The caudal is four twenty-fifths (0.16) of the total length, and is slightly rounded at the extremity. The pectorals equal the head in length (0.20), and barely reach to the vent. The distance from the snout to the upper axilla of the pectorals equals the distance to the origin of the ventrals, and also the length of the ventrals (0.11).

The lateral line is faintly indicated by a delicate line, arching above the pectorals, then running straight along the middle.

The radial formula is as follows:—D., XII-15; A., II, 15½; C., 3-6-5-3; P., 14; V., I-4.

The color is greenish above, becoming white beneath. Twelve or fourteen brownish-violet cross-bands, arranged in pairs, and in part interrupted by three series of whitish dots, so as to form a row of quadrate blotches just above the lateral line. The third row of white dots is more pronounced, the dots becoming short lines, and is situated on the lateral line; a fourth series, less pronounced, may be seen near the lower edge of the body.

A Y-shaped figure of brown upon the chin, the arms extending forward, and three other fine brown lines on each side of the throat, extending transversely upward and backward, continued upon the cheek and opercle by lines of fine brown dots. A row of similar dots may be seen

a little below the base of the anterior part of the dorsal. The fasciæ upon the sides extend on the dorsal, where they take an oblique direction backward. They are most pronounced at the base of the dorsal, forming a series of squares at the point of its junction with the body. The caudal has five or six irregular vertical lines. The anal is pale at its base, the tips of the rays dark brown, pectorals and ventrals dusky.

Measurements.

| | |
|--|------|
| Extreme length, 0 ^m .062..... | 1.00 |
| Body: Greatest height | .16 |
| Head: Length | .20 |
| Greatest width | .14 |
| Length of snout..... | .04 |
| Width of interorbital area | .02 |
| Eye: Diameter | .04 |
| Dorsal (spinous): Distance from snout..... | .22 |
| Length of base..... | .31 |
| Greatest height | .08 |
| (soft): Length of base..... | .30 |
| Greatest height..... | .31 |
| Anal: Distance from snout..... | .42 |
| Height at first ray..... | .11 |
| Height at last ray..... | .05 |
| Pectoral: Distance from snout at axilla..... | .11 |
| Length | .20 |
| Ventral: Distance from snout..... | .11 |
| Length | .11 |

TRIGLIDÆ.

DACTYLOPTERUS VOLITANS, (Linné) Cur.

Pirapebe or *Miripira*, MARCGRAVE, Hist. &c. Brasil, 1648, 162.

Trigla volitans, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 302; ed. 12, 1, 1766, 498.—GMELIN, Linné, Syst. Nat. 1, 1788, 1346.—BLOCH, Ichth. x, 1797, 93, taf. cccli.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 12.—SHAW, Gen. Zool. iv, 622, pl. xci.

Dactylopterus volitans, CUV. & VAL., Hist. Nat. Poiss. iv, 1829, 117.—DEKAY, New York Fauna, Fish. 1842, 49, pl. xvii, f. 46.—MÜLLER & TROSCHEL, Schomburgk, Hist. Barbados, 1848, 667.—GUICHENOT, Explor. Scient. Algérie, Rept. & Poiss. 1850, 41.—CASTELNAU, Anim. Nouv. &c. Amérique du Sud, Poiss. 1855, 26.—POEY, Mem. ii, 1861, 367; Rep. Fis.-Nat. Cuba, ii, 1868, 304.—GILL, Cat. Fish. E. Coast N. Am. 1861, 43; Baird's Rep. on Sea Fisheries of Southern New England, 1873, 799.—GÜNTHER, Cat. Fish. Brit. Mns. ii, 1861, 222.—BAIRD, Rep. on Sea Fisheries of Southern New England, 1873, 824.

Morcielago, PARRA, Deser. Dif. Piez. Hist. Nat. Cuba, 1787, 25, lam. xiv.

Polynemus scerradiatus, MITCHILL, Amer. Month. Mag. 1818, 323 (figured as "The Six-rayed Polyneme," Trans. Lit. & Phil. Soc. N. Y. 1815, pl. iv. f. 10).

Dactylopterus communis, OWEN, Deser. Cat. Ost. Series, Roy. Soc. Surg. 1, 1853, 56.

Gonocephalus macrocephalus, GRONOW, Cat. Fish. (1780), ed. Gray, 1854, 106.

Rare and without a common name. The Colonial Museum at Hamilton and Mr. Bartram's collection at Saint George's each contain a dried specimen. Mr. Jones secured one in Hamilton Harbor in October, 1851.

The species ranges from Newfoundland to Rio de Janeiro, throughout the West Indies, and to the Cape Verde Islands, and the Mediterranean, where it is comparatively common.

SCARIDÆ.

SCARUS RADIANS, Valenciennes.

SPANISH PORGY.

Scarus radians, CUV. & VAL., Hist. Nat. Poiss. xiv, 1839, 207.—STORER, Syn. Fish. N. Am. 1846, 147.—GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 207.—GUICHENOT, Mem. Soc. Imp. Sci. Nat. Cherbourg, 1865, 10.—COPE, Trans. Am. Phil. Soc. 1870, 462.

Labrus radians, CASTELNAU, Anim. Nouv. &c. Amérique du Sud, 1855, 29.

Common, occurring in large schools. The greatest length observed was eight inches. Though seined in quantity, the Spanish Porgies are not eaten, their flesh, like that of the other members of this family, being dry and flavorless.

The species is recorded from Bahia, Mexico, and Saint Martin's. Specimens from Barbados and Jamaica are in the National Museum. Bermuda appears to be the northern limit of its range.

Color.—Above, olive, tinged with reddish-brown; beneath, rose-color; head, upper part of body, and dorsal marbled with brown; caudal irregularly banded with black, the extremity and spots on the membrane white; anal immaculate (in six specimens); base of pectorals black; chin white.

PSEUDOSCARUS VETULA, (Schneider) Gill.

MUD FISH.

Vieja, PARRA, Deser. Dif. Piez. Hist. Nat. Cuba, 1787, 58, lam. 28. fig. 1.

Scarus vetula, BLOCH-SCHNEIDER, Syst. Ichth. 1, 1801, 289 (description founded on Parra's figures).—CUV. & VAL., Hist. Nat. Poiss. xiv, 1839, 193.—STORER, S. N. Fish, N. Amer. 145.—MÜLLER & TROSCHEL in Schomburgk's History of Barbados, 1848, 674.—COPE, Trans. Am. Phil. Soc. 1870, 461.

Pseudoscarus retula, GILL, MS.

Scarus superbus, POEY, Mem. Hist. Nat. Cuba, ii, 1860, 218.

Pseudoscarus superbus, GÜNTHER, Cat. Fish Brit. Mus. iv, 1862, 218.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 346.

Pseudoscarus psittacus, GÜNTHER, op. cit. 225.

The Mud-fish is very common, its gorgeous colors making it very conspicuous as it swims. The young may be seen by the hundred in the shallow rock-pools, while in the deeper waters the larger fish are sailing about with the precision and regularity of a squadron of cavalry under drill. Though its flesh is not unpalatable, this fish is not often brought to market; the enormous scales are much used in fancy work. The species is recorded from several Antilles.

The young fish differ much from the adult in coloration, their markings closely approximating those of *Pseudoscarus sanctæ-crucis* (Schn.) Gthr. Since no specimens of the latter species measuring more than eight or nine inches are on record, and none of *P. retula*, in adult coloring, less than eighteen inches in length have fallen under my observation, it seems possible that the two species may be the same in different stages of growth, particularly since both are usually recorded from the same locality. The question of their identity may be easily decided by the Bermudian naturalists.

As is indicated in the synonymy, *retula* is the specific name properly belonging to this species. Parra (l. c.) gives an excellent figure of the fish under the name *Vieja*, and on this figure Schneider founded his *Scarus retula*, the specific name being a translation of Parra's *Vieja*. Of this fact, Valenciennes was aware, and by it he was guided in adopting the name of Schneider. Professor Poey renamed the species with the remark: "C'est à tort que M. Valenciennes rapport la figure de Parra au *Sc. retula*," seemingly forgetful that Schneider's name was founded not upon specimens, but upon Parra's figure solely. Dr. Günther, adopting the views of Prof. Poey, cites *Scarus retula* as a synonym of *Pseudoscarus psittacus*, (Linn.) Gthr.

PSEUDOSCARUS CERULEUS, (Bloch) Günther.

"CLAMACORE" OR "KILMAGORE."

Novaculx carulca, CATESBY, Nat. Hist. Carolina, Florida and the Bahama Islands, ii, 1743, 18, pl. 18.

Coryphæna carulea, BLOCH, Ichth. v, 120.—GMELIN, Linné, Syst. Nat. 1, 1788, 1791.

Scarus caruleus, SCHNEIDER, Bloch, Syst. Ichth. 1, 1801, 288.

Pseudoscarus caruleus, GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 227.—GUICHENOT, Proc. Soc. Imp. Sci. Nat. Cherbourg, 1865, 24.—POEY, Rep. Fis. Nat. Cuba, ii, 1861, 348.

Trompa, PARRA, Descr. Dif. Piez. Hist. Nat. Cuba, 1787, 57, lam. xxvii, f. 2.

Loro, PARRA, l. c. f. 1.

Scarus loro, SCHNEIDER, op. cit. 288.

Scarus trilobatus, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 21.

Sparus holocyanosus, LACÉPÈDE, op. cit. 45.

The "Clamacore" or "Kilmagore" is very unusual in Bermudian waters; a single specimen of thirty-six inches was taken outside the reefs in April, 1872, and was an object of much curiosity. The color in life was brilliant turquoise-blue, fading to olive-green in alcohol. The species is recorded from Cuba and some of the adjoining islands.

Dr. Günther suggests that this species is probably only the adult stage of one of the other species, such as *Pseudoscarus chloris*,* but an ex-

* The study of the synonymy of this species has brought to light an error, which may be referred to here. It appears that Parra's *Vieja*, No. 3, and Schneider's *Scarus chloris*, founded upon the figure of Parra, belong, not to *Pseudoscarus*, as is intimated by Dr. Günther, but to *Scarus*; such is the judgment of Professor Poey after consulting the type of Parra's description, preserved in the Museum in Madrid. M. Guichenot, after an examination of the types in the Musée d'Histoire Naturelle, Paris, retains in this genus *Scarus virens*, Valenciennes. There now remains only *Scarus quadrispinosus*, Val., as a synonym of Günther's *Pseudoscarus chloris*, and, of these names, that of Valenciennes has undoubted priority. The reversed synonymy should stand then somewhat as follows:—

SCARUS CHLORIS, Schn.

Vieja, PARRA, Descr. Dif. Piez. Hist. Nat. Cuba, 1787, 59, lam. 28, f. 3.

Scarus chloris, SCHNEIDER, Bloch, Syst. Ichth. 1801, 289 (on Parra's figure).—CORE, Trans. Am. Phil. Soc. 1870, 461.

Pseudoscarus chloris, GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 227.

Scarus virens, CUV. & VAL., Hist. Nat. Poiss. xiv, 1839, 203.—STORER, Syn. Fish. N. Am. 1846, 146.—MÜLLER & TROSCHEL in Schomburgk's Hist. Barbados, 1848, 674.

Scarus chrysopterus, SCHNEIDER, op. cit. 286, pl. lviii.—CUV. & VAL., op. cit. 185.—STORER, op. cit. 143.—CORE, op. cit. 462.

Scarus lateralis, POEY, Mem. Hist. Nat. Cuba, 1860, ii, 219; Rep. Fis. Nat. 1, 1867, 337, 375.

HABITAT.—Cuba, Santa Cruz, Saint Christopher's, Saint Thomas, Martinique, Porto Rico, Barbados.

PSEUDOSCARUS QUADRISPINOSUS, (Valenc.) Guichenot.

Scarus quadrispinosus, CUV. & VAL., Hist. Nat. Poiss. xiv, 1839, 197.—STORER, Syn. Fish. N. Am. 1846, 144.

Pseudoscarus quadrispinosus, GUICHENOT, Proc. Soc. Imp. Sci.-Nat. Cherbourg. 1865, 27.

? *Scarus obtusus*, POEY, Mem. Hist. Nat. Cuba, ii, 1860, 217; Rep. Fis.-Nat. ii, 1863, 349.

Pseudoscarus chloris (not Bloch), GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 227.—CORE, Trans. Am. Phil. Soc. 1870, 461.

HABITAT.—Saint Thomas, Cuba, Jamaica, Bahamas.

amination of specimens has convinced me that this is not the case. In the National Museum are two well-characterized specimens of *Pseudoscarus caeruleus*, measuring nine and fifteen inches respectively, both of which have the hump upon the profile well developed, though not so prominent as in the adult specimen of thirty-six inches. Parra's two figures (lamina xxviii) named "Loro" and "Trompa" represent different ages of this species, the prolonged caudal lobes as well as the additional size of the caudal lobe being characters of age.

LABRIDÆ.

CHÆROJULIS RADIATUS, (Linné) Goode.

BLUE-FISH.

Turdus Oculo radiato (Pudding-wife), CATESBY, Nat. Hist. Carol. &c. 1743, ii, 12, tab. xii, fig. 1.

Sparus radiatus, LINNÉ, Syst. Nat. ed. 12, 1, 1776, 472.—GMELIN, Linné, Syst. Nat. 1, 1788, 1278.

Doncella, PARRA, Desc. Dif. Piez. Hist. Nat. Cuba, 1787, 95, lam. xxxvii, fig. 1.

Julis cyanostigma, CUV. & VAL., Hist. Nat. Poiss. xii, 1839, 391 (type 6 inches long).—MÜLL. & TROSCH. in Schomburgk's Hist. Barbados, 1848, 673.—STORER, Syn. Fish. N. Am. 1846, 139.

PlatyGLOSSUS cyanostigma, GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 161.—COPE, Trans. Am. Phil. Soc. 1870, 464.

Chærojulis cyanostigma, POEY, Rep. Fis. Nat. Cuba, ii, 1868, 334.

Julis Principis, CUV. & VAL., op. cit. 402, (type 11 inches long).—STORER, op. cit. 140,

PlatyGLOSSUS principis, GÜNTHER, op. cit. 164.

Julis patatus (partim), CUV. & VAL. op. cit. 398 (types 13 to 15 inches long).—STORER op. cit. 140.

The Blue-fish is frequently taken in the pots, though not valued as food. My largest specimen measures sixteen inches. The common name refers to the color of the adult fish. The species is recorded from several of the West India islands.

Color.—In the adult, a brilliant azure-blue, each scale edged with bright pearly-green. A longitudinal band on anal and the margin of the dorsal light blue. In the young, the prevailing hue is brownish, a large light-blue spot on the base of each scale. Head with spots and longitudinal stripes of light blue. Dorsal with broad margin, and four lines of spots and blotches, longitudinally arranged, of the same color. Caudal with broad white margin, outer rays blue to the extremity, the base of the fin thickly spotted with the same. Anal with border and two longitudinal lines of blue, the fin being thus divided into three

nearly equal parts, a large circular spot of the same color at the base of each ray except the first. Pectoral with the first five rays and a narrow transverse line across the base from the fourth ray blue.

My notes on the colors of young and adult specimens of this species have led me to believe that the different ages have been described under several different specific names, as the synonymy given above would indicate. *Julis cyanostigma* was the name given by Cuvier and Valenciennes to specimens six inches in length, *Julis principis* to those of eleven inches, while those ranging from thirteen to fifteen inches are included under *Julis patatus*. The specimens of larger size ("*l'individus à plus de quinze pouces*"), included under the latter name, probably belong to another species. The Indian fishermen recognize the difference in color to be caused by age.* I have seen specimens with the colors of immaturity, which had attained the length of ten inches. It will probably be found that the change of color is not restricted to any fixed period in the growth of the fish. Should farther investigations sustain the opinion of Dr. Günther† that Linné's *Sparus radiatus* is a different species from that figured by Catesby, the specific name *cyanostigma* should be retained.

LACHNOLEMUS FALCATUS, (Linné) Val.

HOG-FISH.

- Saillus* (Great Hog-fish), CATESBY, Hist. Carol. Florida and the Bahama Islands, ii, 1743, 135, tab. xv.
- Labrus falcatus*, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 284; ed. 12, 1, 1766, 475.—GMELIN, Linné, Syst. Nat. ed. 1, 1788, 1257.—LACÉPÈDE, Hist. Nat. Poiss. &c. iii, 1803, 425, 463.
- Lachnolaimus falcatus*, CUV. & VAL., Hist. Nat. Poiss. xiii, 276.—GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 87.—POEY, Rep. Fis.-Nat. Cuba, ii, 1863, 330.—COPE, Trans Am. Phil. Soc. 1870, 464.
- Lachnolaimus aigula*, CUV. & VAL., op. cit. 277, tab. 388 (type 11 inches long).—STORER, Syn. Fish. N. Am., 136.
- Lachnolaimus dur*, CUV. & VAL., op. cit. 285 (type 8 inches long).—STORER, l. c.
- Lachnolaimus saillus*, CUV. & VAL., op. cit. 286 (type 24 inches long).—STORER, l. c.
- Lachnolaimus caninus*, CUV. & VAL., op. cit. 288 (type 10 inches long).—STORER, l. c.
- Lachnolaimus psittacus*, CUV. & VAL., op. cit. 291.—STORER, l. c.

Very common here, as it is throughout the West Indies. Hog-fish

* Since the above was written, I find that very similar conclusions have been reached by Professor Poey, who gives under *Chærojulis cyanostigma* a synonymy much like the above.

†Cat. Fish. Brit. Mus. iv, p. 164, note.

Ledge, at the entrance to Hamilton Harbor, is marked by a pyramid of stone, called the "Hog-fish Beacon," which is surmounted by a huge iron image of a Hog-fish.

The long streamer-like appendages or continuations of the vertical fins give to the Hog-fish as it swims a singularly graceful appearance. The beauty of those exposed in the market is frequently marred, however, by having had these ornaments bitten off by the craw-fish and lobsters confined with them in the wells of the boats.

The Hog-fish attains the weight of twenty pounds, and is among the choicest of table-fish; its hard, white, exquisitely-flavored flesh has never been found injurious here, though in some parts of the West Indies it is regarded with suspicion. The common name refers to the swine-like profile and dentition.

HARPE RUFUS, (*Linné*) *Gill*.

SPANISH LADY-FISH.

Padiano vermillio, MARCGRAVE, Hist. &c., Brasil, iv, 1648, 145.

Turdus flarus (Hog-fish), CATESBY, Nat. Hist. Carol. Florida and the Bahama Islands, ii, 1743, 11, tab. xi, f. 1.

Labrus rufus, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 284; ed. 12, 1, 1766, 475.—GMELIN, Linné, Syst. Nat. 1, 1788, 1287.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 244.—LACÉPÈDE, Hist. Nat. Poiss. iii, 1803, 427.

Cossyphus rufus, GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 108.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 463.

Harpe rufus, GILL, Proc. Acad. Nat. Sci. Phil. 1863, p. 222.

Bodianus rufus, POEY, Rep. Fis.-Nat. Cuba, ii, 1863, 331.

Perro colorado, PARRA, Descr. Dif. Piez. Hist. Nat. Cuba, 1787, 3, lam. iii, fig. 1.

Bodianus bodianus, BLOCH, Ichth. vii, 1797, 24, tab. ccxxiii.

Cossyphus bodianus, CUV. & VAL., Hist. Nat. Poiss. xiii, 1839, 103.

Lutjanus verres, BLOCH, op. cit. tab. cclv.

Sparus verres, SHAW, Gen. Zool. iv, 1803, 414.

Cossyphus verres, CASTELNAU, Anim. Nouv. ou Rares, Amérique du Sud, Ichth. 1855, 27.

Sparus falcatus, BLOCH, op. cit. tab. cclviii.

Bodianus Blochii, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 279, 290.

Harpe carulco-aureus, LACÉPÈDE, op. cit. 426, 427, tab. viii, fig. 2.

Labrus semiruber, LACÉPÈDE, op. cit. iii, 428.

Not common. The species is also recorded from various of the West India Islands, the Gulf of Mexico, Bahia, Rio de Janeiro, and Saint Helena. Closely-related species are known in the Spanish and French Antilles under the names "Doncella" and "Demoiselle," and the Bermu-

dian name may perhaps be interpreted to mean "the fish which the Spanish call Lady-fish." The name is not inappropriate, for the species is remarkable for the grace of its form and the beauty and elegance of its colors. My specimens measure eight inches.

Color.—Head and upper half of body to the third ray of the soft dorsal rich chestnut-brown; the remainder, including the lower half of the operculum, bright golden-yellow.

The lips have conspicuous folds. The pre-operculum is *very perceptibly denticulated*. The two anterior ventral rays and the soft dorsal and anal and the caudal lobes are much produced, the dorsal and anal prolongations extending to the middle of the median caudal rays; the outer caudal rays are twice as long as the median.

POMACENTRIDÆ.

GLYPHIDODON SAXATILIS, (Linné) Cuvier.

. COW-PILOT; SERGEANT-MAJOR.

Jaguacaquare, MARCGRAVE, Hist. &c. Brasil. iv, 1648, 156.

Sparus fasciis quinque transversis fuscis, LINNÉ, Amœn. Acad. i, 1749, 312.

Chatodon fasciis quinque albis, cauda bifurca, LINNÉ, Mus. Ad. Fried. i, 1754, 54.

Chatodon saxatilis, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 277; ed. 12, 1, 1766, 466.—GMELIN, Linné, Syst. Nat. 1, 1788, 1253.—BLOCH, Ichth. vi, 1787, 71, tab. cevi, f. 2.

Glyphisodon saxatilis, CUV. & VAL., Hist. Nat. Poiss. v, 1830, 446.—MÜLLER & TROSCHEL Schomburgk's Hist. Barbados, 1848, 674.—CASTELNAU, Anim. Nouv. ou Rares, Amérique du Sud, 1855, 11.

Glyphidodon saxatilis, GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 36.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 329.—COPE, Trans. Am. Phil. Soc. 1870, 461.

Chatodon Marginatus, BLOCH, op. cit. tab. ccvii.—LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 451, 463.

Chatodon Mauriti, BLOCH, op. cit. tab. ccxiii, f. 1.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 234.—LACÉPÈDE, op. cit. 452, 470.

Chatodon sargoïdes, LACÉPÈDE, op. cit. 453, 471, 472.

Very common in sheltered waters. The largest, six to eight inches in length, frequent the shallow shaded coves in company with *Pseudoscarus retula*, *Holacanthus ciliaris*, and *Sarothrodus bimaiculatus*. The young may be seen basking in every shallow tide-pool. The origin of the common name is not apparent, unless it refers to some supposed relation between this species and the Cow-fish (*Acanthostracium quadricorne*), such as *Nauarates ductor* is supposed by sailors to hold with the Sharks. The fish is sometimes called the "Sergeant-major," in allusion to the chevron-like bands of yellow on the sides. The species is very common through-

out the West Indies, and has been observed as far south as Bahia and east to the Cape Verde Islands. Its accidental occurrence at Newport, R. I., has been recorded.

Color.—Adults golden-green, young golden-yellow, with five black cross-bands, which are not as broad as the interspaces between them, the first from a point in front of the origin of the dorsal to the base of the pectoral; the second below the third and fifth dorsal spines; the third from the eighth and tenth dorsal spines toward the vent; the fourth from the twelfth and thirteenth dorsal spines to the middle of the anal; the fifth below the end of the soft dorsal and continued on the posterior rays of the dorsal and anal.

The ventrals, soft dorsal, and anal are produced; the fourth and fifth rays of soft dorsal and the fifth and sixth of anal longest. Dorsal and anal prolongations in young reaching to a point half-way between the posterior angle of dorsal and the base of caudal rays; in adults reaching quite beyond the base of caudal rays. External caudal rays twice the length of median.

GERRIDÆ.

EUCINOSTOMUS GULA, (Cuv. & Val.) Goode.

SHAD.

Gerres gula, CUV. & VAL., Hist. Nat. Poiss. vi, 1830, 464.—JENYNS, Zool. Voy. H. M. S. Beagle, 1842, 58.—GÜNTHER, Cat. Fish. Brit. Mus. iv, 1862, 255.—MÜLLER & TROSCHEL, Schomburgk, Hist. Barbados, 1848.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 368.

Diapterus gula, POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 323.

Common and secured in quantity in the shallow bays, with *Decapterus punctatus*, *Eucinostomus Lefroyi*, and *Trachurops crumenophthalmus*. The largest specimens seen, which were apparently adult, measure six inches in length; intermediate sizes down to one inch were observed.

The species has also been seen about Martinique, Santo Domingo, Cuba, Jamaica, and Bahia. The "*Turdus cinereus peltatus*" of Catesby,* for which he gives the common name of "Shad," seems to be identical with this species or the closely-allied *Eucinostomus aprion*, if not with the following species.

EUCINOSTOMUS LEFROYI, Goode.

LONG-BONED SHAD.

Diapterus Lefroyi, GOODE, Amer. Journ. Sci. & Arts, viii, 1874, (Aug.) 123.

This species is distinguished from all other members of the family and genus by its relatively greatly-elongated form. The body is fusiform,

* Natural History of Carolina, Florida, and the Bahamas, ii, p. 11, tab. xi, fig. 1.

compressed; its greatest height, at the thoracic region, being a little less than one-fourth (0.23) of the total length, and a little more than one-fourth (0.27) of the length without caudal (0.89). In *Eucinostomus aprion*, the most elongated of the species hitherto described, the greatest height is but one-third of the length.

The height of the body is uniform under the spinous portion of the dorsal, sloping gently, and at a nearly uniform angle above and below, to the middle of the caudal peduncle. The height of the body behind the dorsal (0.10) is less than one-half, that of the least height of the tail (0.06) is one-fourth of the greatest height of the body.

The scales are large, measuring 0.03 and 0.04 in height, and 0.02 and 0.03 in length; they form about forty-five oblique transverse rows between the head and the caudal, four and a half longitudinal rows between the back and the lateral line, and ten longitudinal between rows the lateral line and the belly.

The length of the head (0.22) equals the greatest height of the body, and is double the greatest width of the head (0.11); the height at the pupil (0.14) is double the width of the interorbital space (0.07). The length of the snout (0.06) equals the length of the operculum (0.06); when the mouth is protruded, the length of the snout is doubled (0.12), and when retracted, the posterior extremity of the intermaxillary process extends to the vertical through the center of the pupil. The nasals are very prominent, and the nostrils are nearer to the orbit than to the extremity of the jaw. The orbit is circular, its diameter (0.08) one-third the length of the head.

The origin of the dorsal is slightly behind that of the ventral; its distance from the snout (0.31) twice the length of its base (0.16). The dorsal spines are graduated nearly in the proportion (I = 0.02; II = 0.12; III = 0.11; IV = 0.10; V = 0.09; VI = 0.085; VII = 0.725; VIII = 0.05; IX = 0.04). The notch between the spinous and soft portions is very deep, and the connecting membrane barely perceptible. In the soft dorsal, the fifth ray is the longest (0.09), and equals the fifth spine; the succeeding rays diminishing regularly to the last, which equals the ultimate spine (0.04); the length of its base (0.20) is greater than that of the spinous dorsals. The anal begins behind the center of the body (0.56); the first spine is very short (0.01), one-fifth the length (0.05) of the second, which is slender; the first ray is the longest (0.08); the succeeding rays regularly diminishing in length to the last (0.03). The lobes of the caudal are equal; the outer rays in length (0.21) five times the inner ones (0.04). The extremity of the pectoral reaches the vertical from the last dorsal spine; its distance

from the snout at the axilla (0.25) is nearly equal to the length of the body. The ventral spine resembles the fifth dorsal spine in shape and size. The length of the longest ray (0.11) slightly exceeds one-third of the distance from the snout to the ventral axilla (0.30); the axillary appendage consists of four lanceolate scales, the first and the longest as long as the last ventral ray.

Color.—Silvery, with a bluish tint above; axils of the pectorals and extremity of snout brownish. Radial formula: D. IX, 10; A. II, 8, P. 12; V. I, 5; C. 3, 9, 9, 3.

The unit of measurement used above is the one-hundredth of the total length, which in an average specimen is 7.29 inches (0^m.185). The species is common in the protected inlets about the islands, in company with the preceding species, the "Shad." The "Long-boned Shad" are in much demand for bait, and are easily seined in large quantities.

The species is dedicated to his excellency Maj. Gen. J. H. Lefroy, F. R. S., governor of the Bermudas, a gentleman of well-known scientific attainments and reputation, who, while doing so much for the social and political welfare of the islands, is also taking an active part in the development of their natural history.

Since the publication of the preliminary description of this fish, I have had the opportunity of comparing specimens from the Bermudas with others sent from Havana to the National Museum by Professor Poey, by whom the species had been recognized as new, and described in MS. under the name of *Encinostomus productus*. The specimens are precisely the same, and coincide in having only two anal spines; a character in which they differ from the remainder of the genus, and which may prove to be, as suggested by Professor Poey, an indication of generic distinction.

TEUTHIDIDÆ.

ACANTHURUS NIGRICANS, (*Linne*) *Gill*.

DOCTOR-FISH.

Turdus rhomboidalis, CATESBY, Nat. Hist. Carolina, Flor. and the Bahama Islands, ii, 1743, 10, tab. x, fig. 1.

Chatodon nigriscens cauda albescente aquali utrinque aculeata, ARTEDI, Desc. Spec. Pisc. 90.

Chatodon nigricans, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 274; ed. 12, 1, 1766, 462.—GMELIN, Liuné, Syst. Nat. 1, 1788, 1245.

Acanthurus nigricans, GILL in Baird's Report Sea Fisheries of Southern New England, 1873, 801.

Acanthurus caeruleus, SCHNEIDER, Bloch, Syst. Ichth. 1801, 214.—CUV. & VAL., Hist. Nat. Poiss. x, 1835, 179.—GUICHENOT, Poiss. in Sagra, Hist. Nat. Cuba, 1845, 121.—STORER, Syn. Fish. N. Amer. 1846, 112.—CASTELNAU, Anim. Nouv. ou Rares, Amérique du Sud, 1855, 25, pl. 12, f. 2.—GÜNTHER, Cat. Fish. Brit. Mus. iii, 1861, 336.—POEY, Rep. Fis.-Nat. Cuba, ii, 1863, 355.—COPE, Trans. Am. Phil. Soc. 1870, 474.

Not uncommon. The species extends through the West Indies, and has also been observed on the coasts of Florida and South Carolina. Its quick nervous movements, as it plays about the recesses in the reef, are very characteristic. The local name has reference to the lancet-like processes on the sides of the caudal peduncle. The "Barbero" and "Barbeiro" of Cuba and Brazil, and the "Chirurgien-bleu," "Porte Lancette," and "Saigneur" of the French Antilles, are names of similar origin.

Color.—Bluish-brown; dorsal and anal with numerous obliquely longitudinal lines of light blue. Caudal spine amber-colored, glassy, posteriorly half as long as anteriorly. A prominence in front of orbit; profile of snout slightly concave. Operculum, pre-operculum, and scapular bones with deep striae. Upper jaw with seven, lower with eight five to eight lobed incisors.

ACANTHURUS CHIRURGUS, (*Bloch*) *Schneider*.

DOCTOR-FISH.

Chatodon nigricans, BLOCH, Ichth. vi, 1787, 60, tab. cciii (not Linné).

Acanthurus nigricans, SCHNEIDER, Bloch, Syst. Ichth. 1801, 211.

Chatodon chirurgus, BLOCH, op. cit. tab. ccviii.—GMELIN, Linné, Syst. Nat. 1788, 1259.

Acanthurus chirurgus, SCHNEIDER, op. cit. 214.—CUV. & VAL., Hist. Nat. Poiss. x, 1835, 168.—GUICHENOT, Poiss. in Sagra, Hist. Nat. Cuba, 1845, 120.—STORER, Syn. Fish. N. Am. 1846, 112.—CASTELNAU, Anim. Nouv. ou Rares, Amérique du Sud, 1855, 24.—GÜNTHER, Cat. Fish. Brit. Mus. iii, 1861, 329.—POEY, Rep. Fis. Nat. Cuba, ii, 1863, 355.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 474.—GILL in Baird's Rep. Fisheries of Southern New England, 1873, 801.

Acronurus fuscus, GRONOW, Cat. Fish. (1780), ed. Gray, 1854, 191.

This species undoubtedly occurs, associated as it always is with the preceding. The name "Tang," found in the list of local names, is probably applied to one or both, if we can judge from the remarkable correspondence of the local names in the Bermuda and Bahama groups.

CHÆTODONTIDÆ.

SAROTHRODUS BIMACULATUS, (*Bloch*) *Poey*.

FOUR-EYED FISH.

Chætodon bimaculatus, BLOCH, Ichth. vii, 1797, tab. ccxix, f. 1.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 225.—CUV. & VAL., Hist. Nat. Poiss. vii, 1831, 67.—STORER, Syn. Fish. N. Am. 1846, 86.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 9.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 371.

Sarothrodus bimaculatus, POEY, Rep. Fis. Nat. Cuba, ii, 1868, 353.—COPE, Trans. Am. Phil. Soc. 1870, 474.

The "Four-eyed Fish" is usually seen in sheltered coves, lazily swimming a few feet below the surface, under the shadow of some high rock. Its local name has reference to the eye-like spots near the tail, which the fishermen believe to be a true pair of eyes. The species is also recorded from the northern West Indies.

Color.—Pearly-gray; snout, posterior edge of operculum, base of pectoral, the anal, caudal, and dorsal bright yellow, blending into the gray of the body. A band, black, edged with yellow, extends from a point in front of and below the first dorsal spine across the eye to the margin of interoperculum; soft dorsal with a large round indistinct black spot at its base between the fifth and twelfth rays, and a small spot of deep black at its angle; soft dorsal with narrow marginal line of black; soft anal with narrow, submarginal band of light blue, anteriorly edged with black; caudal with terminal band of bluish-white, with bright-yellow center; base of ventrals blotched with yellow.

HOLACANTHUS CILIARIS, (*Linné*) *Lacépède*.

ANGEL-FISH.

Acarauna major pinnis cornutis, CATESBY, Nat. Hist. Carolina, Florida, and the Bahama Islands, ii, 31, tab. xxxi, 1743.

Chætodon griseus fuscis quatuor fuscis, LINNÉ, Mus. Ad. Fried. 1, 1754, 62, tab. xxxiii, f. 1. *Chætodon ciliaris*, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 276; ed. 12, 1, 1766, 465.—GMELIN, Linné, Syst. Nat. 1, 1788, 1252.—BLOCH, Ichth. vi, 1788, 83, taf. ccxiv.—SCHNEIDER, Bloch, Syst., Ichth. ed. 1801, 218.

Holacanthus ciliaris, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 527-534.—CUV. & VAL. Hist. Nat. Poiss. vii, 1831, 154.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 46.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 371; Rep. Fis.-Nat. Cuba, ii, 1868, 351.—GILL, Baird, Rep. on Sea Fisheries of Southern New England, 1873, 802.

Gabelita, PARRA, Desc. Dif. Piezas Hist. Nat. Cuba, ii, 1787, 11, tab. vii, f. 1.

Chætodon Parrae, SCHNEIDER, op. cit. 235 (on Parra's figure).

Chatodon squamulosus, SHAW, Nat. Misc. —, 275.

Chatodon Catesbeii, SHAW, Gen. Zool. iv, 1, 1803, 325.

Chatodon cornutus, DESMAREST, Déc. Ichthyol.

Chatodon aculeatus, GRONOW, Cat. Fishes (1780), ed. Gray, 1854, 72.

Common. The species is found, also, in the West Indies, at Bahia, and on the coasts of Mexico. The Angel-fish is partial to sheltered parts of the reef, where it may be seen lazily and gracefully swimming or floating a few feet below the surface. Its motions are very slow, and it frequently swims upon its side, or, sinking to the bottom, swims perpendicularly to the surface, where its bright colors flash for a moment as it floats broadside upward. I have frequently seen them grazing upon the alga-covered rocks. The Angel-fish attains the weight of four pounds, and as far surpasses all the other fishes of the region in its delicious flavor as in its lovely hues. The largest I have seen measured fifteen inches from snout to extremity of soft dorsal.

Color.—Brown with a shade of olive-green, each scale edged with a lighter tint; on the dorsal and anal fins, the brown has reddish tinge. Chin, nape, base of pectoral, borders, and spines of operculum and preoperculum, bright cobalt-blue. Extremity of pectorals, bright yellow. Borders of dorsal and anal bright blue, passing through a vivid green to bright yellow on the slender streamers formed by the prolongations of the soft dorsal and anal fins. Caudal bright yellow, with narrow border of greenish blue. Base of ventrals blue, passing through green into yellow at the extremities. Young and half-grown individuals are ornamented with three or four broad transverse bands of blue and yellow.

My specimens, some twelve in number, differ from all descriptions in the absence of the spot of brown, encircled with blue, on the nape. I have examined numerous West Indian specimens and find it universally present. Should this character prove constant, the Bermuda Angel-fish may be considered a geographical variety, *Holacanthus ciliaris*, var. *Bermudensis*.

HOLACANTHUS TRICOLOR, (Bloch) Lacépède.

BLACK ANGEL-FISH.

Acarauna, EDWARDS, pl. 583, f. 4.

La Feure Coquette, DEHAMEL, Trait. Gén. Pesch. 1782, pt. 2, pl. 13, f. 1.

Catalineta, PARRA, Deser. Dif. Piez. Hist. Nat. Cuba, 1787, 12, lam. vii, f. 2.

Chatodon tricolor, BLOCH, Ichth. xii, 1797, tab. 425.—SCHNEIDER, Bloch, Syst. Ichth.

1801, 219.

Holacanthus tricolor, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 525-530.—CUV. & VAL., Hist. Nat. Poiss. vii, 1831, 162.—CASTELNAU, Anim. Nouv. ou Rares, Amér. du Sud, 1855, 19.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 49.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 371; Rep. Fis.-Nat. Cuba, ii, 1868, 352.

Occasional. Mr. Jones captured a specimen in 1871, and the name occurs on the local list. The species occurs throughout the West Indies, and is also recorded from Bahia and Trinidad.

Chaetodon arcuatus, (Linn.) Cuvier, is also likely to occur in these waters.

XIPHIIDÆ.

The name of "Sword-fish" occurs on the local list. The common Sword-fish (*Xiphias gladius*, Linn.) must occur in Bermuda waters, and probably also *Tetrapturus albidus*, Poey, and *Histiophorus americanus*, Cuv. & Val.

The following reference to the Sword-fish occurs in "Newes from the Bermudas," a pamphlet dated Bermuda, July, 1609, and reprinted in "Force's Historical Tracts," vol. ii.

Whale, *Sword-fish* & *Thrasher*.—"The sword fish swimmes under the whale, & pricketh him upward: The Thrasher keepeth above him, & with a mighty great thing like unto a flaile, hee so bangeth the whale, that hee will roare as though it thundered, & doth give him such blowes, with his weapon, that you would thinke it to be a crake of great shot."—(Page 22.)

SCOMBRIDÆ.

ORCYNUS ALLITERATUS, (*Rafinesque*) Gill.

MACKEREL.

Scomber alliteratus, RAFINESQUE, Caratteri &c. Anim. Sicilia, 1810, 46.

Orcynus alliteratus, GILL, Baird, Rep. Sea Fisheries of Southern New England, 1873, 802.—BAIRD, Rep. Sea Fisheries of Southern New England, 1873, 825.

Maquereau à Quatre Points, GEOFFR. ST. HILARIE, Desc. Egypt. Hist. Nat. 1813, pl. xxiv, f. 3.

Thynnus Leachianus, RISSO, Hist. Nat. Eur. Merid. iii, 1827, 414.

Thynnus thunnina, CUV. & VAL., Hist. Nat. Poiss. viii, 1831, 104.—BLEEKER, Verhandl. Batav. Genootsch. xxiv, 1851, 36.—TEMN. & SCHLEG., Fauna Japonica Poiss. 1850, 95, pl. 43.—GUICHENOT, Rept. et Poiss. Exp. Scient. Algérie, 1850, Poiss. 57.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 364.

Orcynus thunnina, POEY, Rep. Fis.-Nat. Cuba, 1, 1867, 321; ii, 1868, 362.

Thynnus Brasilensis, CUV. & VAL., op. cit. 110.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 373.

Thynnus vagans, LESSON, Voy. Coquille, Zool. ii, 1830, 162, pl. exxxii.

Large schools were observed in March. This large and powerful pelagic fish has been observed in the Mediterranean, on the east of Norway, in the East Indies, on the coasts of Brazil and Cuba, and was found in 1871 by Professor Baird in large numbers at Wood's Hole, Mass., and several have since been taken on the shores of Southern New England. It is highly valued for bait, but is the only large fish which is not thought good to eat; though rather oily, I think it superior to many of the Bermuda food-fishes. It attains the length of two feet and a half.

CARANGIDÆ.

DECAPTERUS PUNCTATUS, (*Agassiz*) *Gill*.

ROUND ROBIN.

Scomber hippos, MITCHILL, Amer. Month. Mag. 1818, 246 (not Linné), (figured as "The Hippios Mackerel," Trans. Lit. & Phil. Soc. N. Y. 1815, pl. 5, f. 5).

Caranx punctatus, AGASSIZ, Selecta Gen. et Spec. Pisc. Brasil, coll. Spix, 1829, 108, pl. lvi a, f. 2.—CUV. & VAL., Hist. Nat. Poiss. ix, 1833-38.—DEKAY, New York Fauna, Fish, 1842, 122, pl. 73, f. 123 (copied from Mitchell).—STORER, Syn. Fish. N. Am. 1846, 101.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 446.

Decapterus punctatus, GILL, Proc. Acad. Nat. Sci. Phila. 1862, 432; and in Baird, Rep. on Sea Fisheries of Southern New England, 1873, 803.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 368 (see, also, Mem. ii, 374).—BAIRD, Rep. on Sea Fisheries of Southern New England, 1873, 825.

Very common. This species ranges along the coast from Brazil to Cape Cod, and has been seen at Cuba and Martinique. The Round Robin is seined in great numbers in Hamilton Harbor, in company with the various species of *Clupeidæ* and *Gerridæ*, and is sold from row-boats along the quay at the legal rate of four-pence a pound. The largest measure six inches. "Jigging robins" is a favorite amusement of the little negroes. A few bread-crumbs are thrown over the dock, and the little fish collect in such numbers that a line with a bare fish-hook jerked rapidly through the group seldom fails to impale one or more. The local name seems to be fanciful in origin; at Barbados, it is given to the allied species *Decapterus macarellus*, which perhaps also occurs at the Bermudas.

Color.—Above, olive-brown; beneath, white, with pearly reflections. A golden stripe along the lateral line, studded with small black spots, which cease at the commencement of the lateral plates. Eye yellow, with black iris.

TRACHUOPS CRUMENOPHTHALMUS, (Bloch) Gill.

GOGGLER; GOGGLE-EYE.

Scomber crumenophthalmus, BLOCH, Ichth. x, 1797, 65, taf. ccexliii.

Caranx crumenophthalmus, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 107.—CUV. & VAL., Hist. Nat. Poiss. ix, 1833, 62.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 429.

Trachurops crumenophthalmus, GILL, Proc. Ac. Nat. Sci. Phila. 1862, 432; and in Baird, Reps. on Sea Fisheries of Southern New England, 1873, 803.—POEY, Rep. Fis. Nat. Cuba, ii, 1868, 367.—BAIRD, Rep. on Sea Fisheries of Southern New England, 1873, 825.

Scomber balantiophthalmus, SCHNEIDER, Bloch, Syst. Ichth. 1801, 29.

Scomber plumieri, BLOCH, op. cit. tab. ccclxiv.—SCHNEIDER, op. cit. 30.

Caranx plumieri, CUV. & VAL., op. cit. 65.—MÜLL. & TROSCHE, Schomburgk, Hist. Barbados, 1848, 669.—GUICHENOT, Poiss. in Sagra, Hist. Nat. Cuba, ii, 1845, 110.

Caranx Daubentonii, LACÉPÈDE, op. cit. iii, 59, 71.

Caranx macrophthalmus, RÜPPELL, Atlas, Reise Nord-Africa, Fische, 1828, 97, tab. xxv, f. 4 (not Agassiz).

Caranx macrophthalmus, AGASSIZ, in Spix, Select. Gen. & Spec. Pisc. Brasil, 1829, 107, pl. lvi a, f. 2 (not Rüppell).

Caranx mauritanus, QUOY & GAIMARD, Voy. Uranie & Physicienne, Zool. 1824, 359.

Common; the species, like the preceding, is found in the West Indies and on the coast of the United States to Southern Massachusetts; it is found also at Mauritius, in the Pacific and Indian Oceans, the Red Sea, and on the coast of Guinea. The Goggler reaches the weight of a pound, is found with the preceding, and is used for food. The local names refer to its great, staring eyes.

Color.—Above, bluish; beneath, silvery white.

PARATRACTUS PISQUETUS, (Cuv. & Val.) Gill.

JACK; BUFFALO JACK.

Caranx pisquetus, CUV. & VAL., Hist. Nat. Poiss. ix, 1833, 97.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 373.

Paratractus pisquetus, GILL, Proc. Ac. Nat. Sci. Phila. 1862, 432; Baird's Rep. Sea Fisheries of Southern New England 1873, 803.—POEY, Rep. Fis. Nat. Cuba, ii, 1868, 365.—BAIRD, Rep. Sea Fisheries of Southern New England, 1873, 825.

Caranx chrysos, DEKAY, Fishes, New York Fauna, 1842, 121, pl. xxvii, f. 85 (not *Scomber chrysos*, Mitchill).—BAIRD, Fishes New Jersey Coast, 1855, 22.

Carangus chrysos, GIRARD, Ichth. U. S. & Mex. Bound. Surv. 1859, 23.

Caranx hippos, HOLBROOK, Ichth. South Carolina, 1856, 83, pl. xii, fig. 2 (not *Scomber hippos*, Linné).

Carangus hippos, Gill, Cat. Fish. E. Coast N. Am. 1861, 36.

Trachurus squamosus, GRONOW, Cat. Fish. (1780), ed. Gray, 1854, 125.

The Jack, or Buffalo Jack, is common, occurring also in the West

Indies and on the coast of Brazil, and the United States as far north as Cape Cod. Its habits closely resemble those of the preceding species. My largest specimen is nine inches long; the fishermen claim that the species attains the weight of five or six pounds, but they probably confound this with some other species of the same family.

Color.—Above, light slate; beneath, pearly white; snout and line over the orbit blue. Second dorsal margined with black. Base of lateral plates and tip of caudal light brown.

NAUCRATES DUCTOR, (*Linné*).

PILOT-FISH.

Gasterosteus ductor, LINNÉ, Syst. Nat. ed. 10, 1, p. 295.

Naucrates ductor, CUV. & VAL., Hist. Nat. Poiss. viii, p. 312, pl. 332.

This universally-distributed species occasionally finds its way into the hands of the Bermudian fishermen.

ZONICHTHYS FASCIATUS, (*Bloch*.) Swainson.

BONITO.

Scomber fasciatus, BLOCH, Ichth. x, 61, taf. cccxli, 17; Syst. Ichth. ed. SCHNEIDER, 29.

Seriola fasciata, CUV. & VAL., Hist. Nat. Poiss. ix, 211, 1833.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 464.

Zonichthys fasciatus, SWAINSON, Nat. Hist. Fish. & Rept.—GILL, Cat. Fish. E. Coast N. Am. 1861, v, 36, and in Rep. U. S. Com. Fish. 1871, 803.

Halatractus fasciatus, POEY, Rep. Fis. Nat. Cuba, ii, 373, 1868.

Not uncommon; recorded also from Cuba and South Carolina. A specimen was taken near New York in October, 1875, and is now in the National Museum. The Bonito is an excellent table-fish, and reaches the length of two feet or more.

The "Amber-fish," the "Guelly," or "Cavally" (Caballa?), the "Slippery Dick," and the "Skip-jack" of the fishermen probably belong to this family; but, as I secured no specimens, they cannot be identified. The "Skip-jack" is perhaps an *Oligoplites*, and the "Amber fish" is doubtless a *Seriola*.

CORYPHÆNIDÆ.

CORYPHÆNA HIPPURUS, *Linn*.

DOLPHIN.

Coryphæna hippurus, LINNÉ, Syst. Nat. ed. 12, i, 446.

I observed a Dolphin, measuring five or six feet, playing about our steamer in the Gulf Stream, about two hundred miles northwest of the Bermudas. The Dolphin is well known to the fishermen.

MULLIDÆ.

HYPENEUS MACULATUS, (*Bloch*) *Cuv.*

GOAT-FISH.

Pira metara, MARCGRAVE, Hist. &c. Brasil, 1648, 156, 181.

Mullus maculatus, BLOCH, Ichth. x, 1797, 79, tab. 348.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 78.

Upeneus maculatus, CUV. & VAL., Hist. Nat. Poiss. iii, 1829, 478.—STORER, Syn. Fish. N. Am. 1846, 48.—POEY, Mem. Hist. Nat. Cuba, i, 1853, 223; ii, 1861, 367.—CASTEL-NAU, Anim. Nouv. &c. Amérique du Sud, Pois. 1855, 6.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 408.—COPE, Trans. Am. Phil. Soc. 1870, 471.

Mulhypseneus maculatus, POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 307.

I did not secure a specimen, but was told that a fish of this description is common among the reefs. Godet, in his "History of Bermuda," gives a description of color which is apparently taken from specimens by him, which renders the identification sufficient? certain. The species is also recorded from Cuba, Jamaica, Martinique, and Rio de Janeiro.

BERYCIDÆ.

HOLOCENTRUM SOGO, *Bloch.*

SQUIRREL.

Jaquaraca, MARCGRAVE, Hist. &c. Brasil, 1648, 147.

Perca marina rubra, CATESBY, Nat. Hist. Carolina, Florida, and the Bahama Islands, ii, 1743, 2., tab. ii, f. 2.

Bodianus pentacanthus, BLOCH, Ichth. vii, 1797, 29, tab. cexxxv (a badly-distorted copy of Maregrave's figure).

Holocentrus sogo, BLOCH, op. cit. 46, tab. cexxxii.

Holocentrum sogho, GILL, Cat. Fish. E. Coast N. Am. 41, 186; and in Baird's Rep. on Sea Fisheries of South. New England, 1873, 804.

Holocentrus rubellus laminis branchiostegis serratis etc., BROWN, Hist. &c. Jamaica, 1799, 447.

Sogo holocentrus, SHAW, Gen. Zool. v. 1803, 555.

Bodianus jaguar, LACÉPÈDE, Hist. Nat. Poiss. &c. iv, 1803, 236.

Sciæna rubra, SCHNEIDER, Bloch, Syst. Ichth. 1801, 82 (not Forskål).

Eolocentrum longipinne, CUV. & VAL., Hist. Nat. Poiss. iii, 1829, 181.—STORER, Syn. Fish. N. Am. 1846, 46.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 28.—COPE, Trans. Am. Phil. Soc. 1870, 465.

Common; its bright color and nervous darting motions rendering it one of the most conspicuous denizens of the rock-pools. It is found

throughout the West Indies and south to Brazil. Their voracity is very great, and the tyro in angling usually finds his first prize to be a "Squirrel." They are not often eaten. They breed plentifully about the islands, and reach a length of fifteen inches; the lobes of the vertical fins becoming proportionally more and more produced with age. The local name is the same as that given by Catesby, and refers to a grunting noise uttered by them, which resembles the bark of a squirrel.

The Cuban form seems to be nearly the same; but Professor Poey hesitatingly places it in a distinct species.

SCIÆNIDÆ.

GENUS PAREQUES, *Gill*, MS.*

PAREQUES ACUMINATUS, (*Schneider*) *Gill*.

CARRUB.

Grammistes acuminatus, SCHNEIDER, Bloch. Syst. Ichth. 1801, 184.

Eques acuminatus, CASTLENAU, Anim. Nouv. &c. Amérique du Sud, Poiss. 1855, 11.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 280.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 370; Rep. Fis.-Nat. Cuba, ii, 1868, 325.—COPE, Trans. Am. Phil. Soc. 1870, 471.

Eques lineatus, CUV. & VAL., Hist. Nat. Poiss. v, 1830, 169.

Common here, though of rare occurrence elsewhere, having been observed only at Cuba, Santa Cruz, and Bahia; not valued for food. My specimens measure eleven inches. The name "Carrub" is inexplicable, unless it be a corruption of "Carp."

Color.—Tawny; yellow; extremities of fins and base of pectorals and ventrals blackish-brown; head blotched with the same. Two specimens have seven straight, longitudinal lines upon the side; the third is without any traces of such markings. Whether this difference is sexual, I have no means of determining. The first dorsal is one-fourth the height of the body, measured immediately below it.

* The genus *Pareques* is distinguished, according to Professor Gill, by the development of the spines of the first dorsal fin in normal number, (ten or eleven,) as well as other osteological characters.

SPARIDÆ.

CALAMUS MEGACEPHALUS, (*Swainson*) *Poey*.

GOAT'S HEAD PORGY.

Pagellus calamus, CUV. & VAL., Hist. Nat. Poiss. vi, 1830, 206, pl. 152.—POEY, Mem. Hist. Nat. Cuba, ii, 1861, 367.

Sparus calamus, POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 308.

Calamus megacephalus, SWAINSON, Nat. Hist. Fish, ii, 1839, p. 222.—GUICHENOT, Mem. Soc. Imp. Sci. Nat. Cherbourg, xix, 1868, 112.—POEY, Ann. Lyc. Nat. Hist. x, 1874, 178.

Common; found also in the West Indies, reaching south to Bahia. My specimens measure from six to eighteen inches.

CALAMUS ORBITARIUS, *Poey*.

SHEEP'S-HEAD PORGY.

Pagellus orbitarius, POEY, Mem. Cuba, ii, 1860, 201; 1861, 367.

Sparus orbitarius, POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 308.

Calamus orbitarius, POEY, Ann. Lyc. Nat. Hist., N. Y., x, 1874, 79.

Common; recorded also from Cuba. This species very closely resembles the preceding in form and habits, but is easily distinguished by the shortness of the snout, which gives it a very abrupt profile. In *S. calamus*, the diameter of the orbit is contained twice in the distance from the extremity of the snout to the perpendicular from the anterior border of the orbit; in *S. orbitarius*, once and one-half. The height of the two specimens before me is the same; and, in *S. calamus*, the height is contained in the length twice and three-quarters; in *S. orbitarius*, twice and one-half. The specimens measure sixteen and fifteen inches, respectively.

Color.—Both species, greenish-olive, with golden longitudinal stripes.

The names Goat's-head and Sheep's-head no doubt refer to the enormous pre-orbital bones which impart an ovine physiognomy to the fish. The Porgies are taken with the hook in large quantity, and rank among the most salable kinds. They live in deep water; and, when brought to the surface, their bellies are greatly expanded from the removal of pressure, giving them a very comical appearance.

SARGUS VARIEGATUS, (*Lacépède*,) *Goode*.

CHUB.

Sparus Sargus, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 278; ed. 12, 1, 1766, 469.—GMELIN, Linné, Syst. Nat. 1, 1788, 1270.—BLOCH, Ichth. viii, 1797, 31, tab. cclxiv.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 270.—LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 27, 77.—Risso, Ichth. Nice, 1810, 236.

Sargus variegatus, LACÉPÈDE, op. cit. iv, 1803, 207 (from HAÜY, Encyclopédie Méthodique.)

Sargus raucus, GEOFFROY St. HILAIRE, Descr. de l'Égypte, Poiss. 1813, pl. xviii, f. 1.

Sargus Rondeletii, CUV. & VAL., Hist. Nat. Poiss. vi, 1830, 14, pl. cxli.—VALENCIENNES.

Webb & Berthelot, Hist. Nat. Canaries, Poiss. 1836, 28.—GUICHENOT, Expl. Scient. Algérie, Poiss. 1850, 46.—GÜNTHER, Cat. Fish. Brit. Mus. 1861, 44.

Very abundant; occurring in large schools in company with *Pimelopterus Boscii*, which it closely resembles in form and habits. It is strictly European, and is especially common in the Mediterranean, but has not been found west of Madeira and the Canaries. I have carefully compared Bermudian specimens with Mediterranean specimens in the Bonaparte collection labeled *Sargus Rondeletii*. The Chub is seined in vast quantities in Hamilton Harbor and other secluded bays. My specimens measure from ten to twelve inches.

PIMELEPTERIDÆ.

PIMELEPTERUS BOSCI, *Lacépède*.

BREAM.

Chatodon cyprinaceus, BROUSSONET, MS.—GMELIN, Linné, Syst. Nat. 1, 1788, 1269, note *Pimelopterus Boscii*, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 429.—CUV. & VAL., Hist. Nat.

Poiss. vii, 1831, 258.—VALENCIENNES, in Webb & Berthelot, Hist. Nat. Canaries, 1836, pl. xix.—DEKAY, Zool. N. Y. Fishes, 1842, 100, pl. xx, fig. 56.—STORER, Syn. Fish. N. A. 1846, 89.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 497.—GILL, Cat. Fish. E. Coast N. Am. 1861, 31.—POEY, Rep. Fis.-Nat. Cuba, ii, 1863, 323.—GILL, in Baird's Rep. on Sea Fisheries of S. New England, 1873, 805.—BAIRD, Rep. Sea Fisheries of S. New England, 1873, 824.

Pimelopterus incisor, VALENCIENNES, op. cit. 805.

Common. The Bream is always found in company with the preceding species, to which it is very like in size, shape, and habits, and is taken with it in large numbers and brought to the market. It is easily distinguished from the Chub, as far as it can be seen under water, by the large black spot just behind the dorsal. It is also recorded from Madeira,

the Canaries, Jamaica, and Cuba. A single specimen was taken in the spring of 1873, at Staten Island, New York Harbor, by Mr. C. L. Copley, and sent by him to the Smithsonian Institution.

Color.—Golden-brown, with a longitudinal stripe of gold along the center of each row of scales, a silvery streak along the preorbital.

PRISTIPOMATIDÆ.

HÆMYLUM CAPEUNA, (*Lichtenstein*) Goode.

WHITE GRUNT.

Capeuna Brasiliensibus, MARCGRAVE, Hist. &c. Brasil, i, 1648, 155, f. 163.

Grammistes trivittata, SCHNEIDER, Bloch, Syst. Ichth. 1801, 188 (on Maregrave's figure)

Serranus capeuna, LICHTENSTEIN, Abhandl. Berl. Akad. 1820-1, 288 (on Maregrave's figure).

Hæmulon quadrilineatum, CUV. & VAL., Hist. Nat. Poiss. v, 1830, 288, pl. cxx.—STORER, Syn. Fish. N. Am. 1846, 75.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 316.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 319.—GILL, in Baird's Rep. Sea Fisheries of S. New England, 1873, 806.

Hæmulum quadrilineatum, COPE, Trans. Am. Phil. Soc. 1870, 471.

Hæmulon quinquelineatum, POEY, Mem. Hist. Nat. Cuba, ii, 1861, 419; Rep. Fis.-Nat. Cuba, i, 1867, 310; ii, 1868, 162.

Common, occurring in schools. My specimens measure four inches. Cuvier's description of the color is excellent; but Günther, in quoting it, fails to mention, either in generic or specific diagnoses, the brilliant red of the lips and mouth, which Cuvier thought of sufficient importance to found upon it his generic name *Hæmulon*. I have made use of the specific name *capeuna*, because it seems to have priority over that usually accepted. The name *trivittata* can scarcely stand, since it is not only inapplicable, but sure to mislead, as is evident from the two other names which have been given to the species, viz, *quadrilineatum* and *quinquelineatum*.

The species is recorded from Brazil, San Domingo, and Cuba.

HÆMYLUM CHRYSOPTERUM, (*Linné*) Cuvier.

MARGATE-FISH.

Perca marina gibbosa cinerea (Margate-fish), CATESBY, Hist. Carolina, Florida, and Bahamas, ii, 1743, 2, pl. ii, f. 1.

Perca chrysoptera, LINNÉ, Syst. Nat. ed. 12, 1766, 485.—GMELIN, Linné, Syst. Nat. 1, 1788, 1314.

Lutjanus chrysopterus, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 186, 226.

Hamulon chrysopteron, CUV. & VAL., Hist. Nat. Poiss. v, 1830, 240—DEKAY, New York Fauna, Fishes, 1842, 85, pl. vii, f. 22.—STORER, Syn. Fish. N. Am. 1846, 75.—HOLLROOK, Ichth. South Carolina, 1855, 120, pl. xvii, f. 1.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 313.—GILL, in Baird's Rep. Sea Fisheries of S. New England, 1873, 806.

The Margate-fish of the fishermen is probably this species. It is common in summer, but was not to be found in the markets at the time of my visit. The species is recorded from the West Indies and Brazil. The fishermen recognize several others, as the Yellow, Streaked, Spotted, and Black Grunts, all of which probably belong to this family, if not to this genus.

LUTJANUS CAXIS, (*Schneider*) *Poc.*

GRAY SNAPPER.

Caxis, PARRA, Deser. Dif. Pie. Hist. Nat. Cuba, 1787, 14, lam. viii, f. 2.

Sparus Caxis, SCHNEIDER, Bloch, Syst. Ichth. 1801, 284.

Lutjanus Caxis, POEY, Rep. Fis.-Nat. Cuba, i, 1867, 269; ii, 1868, 293.—GILL, in Baird's Report on Sea Fisheries of S. New England, 1873, 806.

Bodianus Franet, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, pl. iv, f. 3 (on a figure by Plumier).

Sparus tetracanthus, BLOCH, Ichth. viii, 1797, 279, 930 (on a figure of Plumier).

Cichla tetracantha, SCHNEIDER, op. cit. 338.

? *Bodianus striatus* (*Fasciatus*), SCHNEIDER, op. cit. 335, tab. lxx.

Lutjanus acutirostris, DESMAREST, Déc. Ichth. pl. ii, f. 1 (fide Cuvier).

Mesoprion griseus, CUV. & VAL., Hist. Nat. Poiss. ii, 1829, 471.—STORER, Syn. Fish. N. Am. 1846, 34.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 195.

Very common; distributed also throughout the Caribbean Sea and the Gulf of Mexico, and, according to Günther, who considers it identical with *Mesoprion goreensis* Cuv. & Val., extending east to the African coast. It breeds abundantly, and hundreds of individuals from four feet to four inches in length may be seen in almost any sheltered nook. It is one of the most delicious of food-fish, its flavor not unlike that of the Blue-fish (*Pomatomus saltatrix*). Its extreme cunning renders it very difficult to capture with either hook, pot, or grains, and has gained it the *soubriquet* of "Sea Lawyer". The market-name is "Gray Snapper".

Color.—Dark gray, changing but slightly in spirits.

The synonymy of this and the allied forms is much ensnarled, and a careful study of a full series of specimens is desirable.

LUTJANUS AYA, (Bloch) Gill.

YELTING; GLASS-EYED SNAPPER.

Acara aya, MARCGRAVE, Hist. &c. Brasil, 1648, 167.*Bodianus aya*, BLOCH Ichth. 1797, 33, tab. cccxvii (on a figure by Prince Maurice).—
LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 286.*Mesoprion aya*, CUV. & VAL., Hist. Nat. Poiss. ii, 1829, 457.—? GUICHENOT, Sagra's Hist.
Nat. Cuba, Poiss. 1845, 24.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 198.*Lutjanus aya*, GILL, MS.*Bodianus ruber*, SCHNEIDER, Bloch, Syst. Nat. ed. 1801, 330.

Common. It probably breeds, as individuals of all ages occur; the largest weigh ten pounds or more, and are much esteemed as food. Its abrupt profile and large eyes give it a very sparoid appearance; to the latter feature it no doubt owes one of its popular names, a similar epithet being applied to the large-eyed *Stizostedion americanum*, the Wall-eyed or Glass-eyed Pike of the great lakes and the Mississippi Valley. The name "Yelting" is very puzzling.

Color.—Brilliant rose-red, fading in spirits to grayish-olive, with black blotch along the base of the soft dorsal; base of pectoral deep black.*

The species is peculiarly West Indian. Large specimens are sometimes brought in winter to the Washington market, in lots from Florida.

The Schoolmaster Snapper and Silk Snapper of the fishermen probably belong to this genus. The Spot Snapper and the Yellow-tail correspond doubtless to *Mesoprion unnotatus* (Cuv. & Val.) Gill, and to *Ocyurus chrysurus* (Bl.) Gill. *Lutjanus cynodon* (Cuv.) Gill probably also occurs. All these species are peculiarly West Indian.

SERRANIDÆ.

TRISOTROPIS UNDULOSUS, (Cuvier) Gill.

ROCK-FISH.

Perca marina venenosa punctata (Rock-fish), CATESBY, Nat. Hist. Carolina, Florida, and
Bahamas, ii, 1743, 15, tab. xv.—CUV. & VAL., Hist. Nat. Poiss. ii, 1829, 386.
Serranus undulosus, CUV. & VAL., op. cit. 295.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861,
143.

Trisotropis undulosus, GILL, Proc. Acad. Nat. Sci. Phila. 1865, 105.*Serranus brunneus*, POEY, Mem. Hist. Nat. Cuba ii, 1860, 1314.

* Dr. Günther, in the "Synopsis of the Species", which serves as a key to the genus places this and the preceding species under the head "*aa. Ground-color olive, with a yellow, green, or brown shade.*" This is certainly very apt to mislead, and illustrates the difficulty of drawing correct ideas from the study of distorted and discolored museum-specimens.

Trisotropis brunneus, GILL, l. c.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 156, 234; *Annals Lyc. Nat. Hist. N. Y.* ix, 1870, 305.

Serranus arara, POEY (not CUV. & VAL.), Mem. ii, 1860, 132.

Serranus decinalis, POEY, Mem. ii, 1860, 138.

Serranus cyclopomatus, POEY, Mem. ii, 1861, 353; Rep. ii, 1863, 284.

Serranus latepictus, POEY, Mem. ii, 1861, 353.

Very common; recorded also from the West Indies and the coast of Brazil. The Rock-fish attains the length of four or five feet, and is one of the choicest of table-fishes, though Catesby declares that his "Rock-fish", which seems most probably the same, "has the worst character for its poisonous quality of any other among the Bahama Islands".

Color.—Brown, thickly mottled with large, irregularly quadrilateral spots of brownish-violet. The sides of the head are marked with wavy, irregular lines of deep violet. Dorsal broadly margined with black; caudal, anal, and ventral tipped with deep black, which gradually shades into the color of the body; pectorals tipped with orange.

It may be regarded as somewhat doubtful whether the species of Cuvier is identical with that whose diagnosis is given by Dr. Günther under the same name, since the former makes no allusion to the yellow tips of the pectorals. Professor Poey, after an examination of one of Cuvier's types, pronounces it distinct from his *Serranus brunneus* by reason of a slightly-rounded caudal. The *Serranus undulosus* defined by Günther coincides with Poey's *Serranus brunneus* in its truncated caudal and in other respects. I have provisionally accepted Günther's identification of Cuvier's species. Catesby's figure disagrees in its slightly-forked caudal, but in other respects corresponds with the specimen before me; and, since no conjecture has been offered as to its relations, I have, after making allowances for the carelessness which the artist manifests in many of the other plates, ventured to refer it to the same species.

TRISOTROPIS GUTTATUS, (*Schneider*) *Gill*.

RED ROCK-FISH.

Bonacé cardinal, PARRA, Descr. Dif. Piez. His. Nat. Cuba, 1787, 29, lam. xvi, f. 1.

Johnius guttatus, SCHNEIDER, Bloch, Syst. Ichth. 1801, 77 (on Parra's figure).

Trisotropis guttatus, GILL, Proc. Acad. Nat. Sci. Phila. 1865, 105.

Serranus cardinalis, CUV. & VAL., His. Nat. Poiss. ii, 1829, 378 (on Parra's figure).—
STORER, Syn. Fish., N. Am., 1840, 27.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861,
57, note 19.—POEY, Rep. Fis.-Nat. Cuba, i, 1867, 200.

Trisotropis cardinalis, POEY, op. cit. ii, 282; *Annals Lyc. Nat. Hist. N. Y.* ix, 1870, 303.

Serranus rupestris, CUV. & VAL., op. cit. ix, 1833, 437.—STORER, op. cit. 29.—GÜNTHER,
op. cit. 145.

With some doubt I refer to this species the Red Rock-fish of the Bermuda market. In habits, form, and dimension, it much resembles the preceding. It is recorded from Saint Bartholomews, Cuba, and San Domingo, and at the latter place is called by the same name as in Bermuda.

EPINEPHELUS STRIATUS, (*Bloch*) *Gill*.

HAMLET; GROUPEE.

Cherna, PARRA, Desc. Dif. Piez. Hist. Nat. Cuba, 1787, 50, lam. xxiv.

Anthias striatus, BLOCH, Ichth. ix, 1797, 103, tab. 324 (on a figure by Plumier).

Lutjanus striatus, LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 324.

Serranus striatus, CUV & VAL., Hist. Nat. Poiss. ii, 1829, 288.—STORER, Syn. Fish. N. Am. 1846, 27.—GUICHENOT, Sagra's Hist. Nat. Cuba, Poiss. 1850, 12.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 110.

Epinephelus striatus, GILL, Proc. Acad. Nat. Sci. Phila. 1865, 105.—POEY, Rep. Fis. Nat. Cuba, ii, 1868, 285.—COPE, Trans. Am. Phil. Soc. 1870, 466.

Anthias cherna, SCHNEIDER, Bloch, Syst. Ichth. ed. 1801, 310 (on Parra's figure).

Sparus chrysomelanurus, LACÉPÈDE, op. cit. 160. (on a bad copy of Plumier's figure).

Very common; found also throughout the Caribbean Sea and the Gulf of Mexico. The Grouper attains an enormous size; and, on account of its abundance and the ease of capturing, it is used as food more than any other species. Its flesh is rather inferior in flavor and coarse in texture, especially that of large individuals. Great numbers are caught off the islands, and are brought in the wells of the smacks to the artificial ponds along the shore, where they are kept for the market, and are fed on fish and lobsters.

The "Devil's Hole" is a large natural pool near the center of the main island, and about one hundred feet from the south shore of Harrington Sound. Here a large number of Groupers may usually be found confined, and the place is much visited by strangers. At feeding-time, when one looks into the clear waters of the pool, nothing can be seen but an array of great open mouths. When the food is thrown in, a scene of indescribable commotion and splashing ensues. They are very fierce, and rush savagely at anything which looks eatable. I have seen two large ones, each four feet in length, seize the opposite ends of a cuttle-fish arm tugging for several minutes at the tough morsel before the question of ownership could be decided.

The young fish are called Hamlets; but, after reaching a length of eighteen or twenty inches, are known as Groupers; the latter name is a corruption of the Portuguese *Garoupa*, which is applied to a similar fish found at Madeira.

Color.—Adult fishes range from a light-slate color to a deep chestnut-brown. In some individuals a narrow band of black extends from the tip of the snout to a point between the eyes, where it divides; the branches extending, one to the origin of the dorsal and the other to the angle of the operculum, and upward to unite with the first at the origin of the dorsal. The lips and throat are bright vermilion.

A great variation is apparent in the color of different individuals, which has not yet been satisfactorily explained, though it is no doubt due to the depth of water or color of the bottom in the place where they are taken, as is suggested below under *Enneacentrus punctatus*. The fishermen claim that the color of individuals confined in the ponds changes from one extreme to the other within the period of a few weeks. I have myself seen very considerable variation in color in the course of a week in fishes confined in shallow fish-ponds. The young fish are always slate-color and are also marked with six or seven broad, transverse bands of light brown and a large quadrangular black blotch across the back of the tail behind the dorsal.

EPINEPHELUS GUTTATUS, (*Gmelin*) *Goode*.

HIND.

? *Cugupuguacu*, MARCGRAVE, Hist. &c. Brasil, 1648, 169.—SLOANE, Voyage aux Îles de Madère, des Barbades, de St. Christophe, et de la Jamaïque, 1727, tab. cexlvii.—*Cugupuguacu* Brazil, CATESBY, Nat. Hist. Carolina, Florida, and Bahamas, ii, 1743, 14, tab. xiv (the Hind).

Perca guttata, GMELIN, Linné, Syst. Nat. 1, 1788, 1315 (on a figure by Catesby).—CUV. & VAL., Hist. Nat. Poiss. ii, 1828, 372.

Bodianus apua, BLOCH, Ichth. vii, 1797, 37, tab. cexxix (on a figure by Prince Maurice).—LACÉPÈDE, Hist. Nat. Poiss. iv, 1803, 296.

? *Serranus apua*, CUV. & VAL., op. cit. 287 (citing as a synonym *Piraticapia*, MARCGRAVE, op. cit. 158).

Serranus apua, GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 140.

Bodianus marginatus, SCHNEIDER, Bloch, Syst. Ichth. 1801, 331.

Very common; recorded also from Jamaica, and probably from Brazil. The Hind is readily sold in the market, where specimens two feet in length are sometimes seen.

The name Hind perhaps refers to the spotted markings as similar to those of the deer. The name is found in nearly all the English West Indian islands, applied to the spotted species of this family.

Color.—Brownish, red, or rosy-white, with numerous small circular spots of deep rose-color, fading to brown in spirits. Vertical fins broadly margined with black.

The Hind is subject to great variations of color, specimens from the "white water", where there is a bottom of white sand, being nearly white, while others have the ground-color a dusky reddish-brown.

The descriptions of Gmelin and Bloch were both founded upon drawings, and their relations are somewhat doubtful. The former has been preferred, since the figure of Catesby agrees precisely with the Bermuda "Hind", except in the smaller number of dorsal spines, a matter of detail not likely to have been noticed by Catesby, judging from his other figures. The Bermudian form is much more likely to be identical with that from the Bahamas and Jamaica than that from Brazil, if, indeed, they are not all identical. Günther records from Jamaica his *Serranus apua*, which is, beyond a doubt, the Bermuda species, thus furnishing another argument for its identity with that figured by Sloane.

ENNEACENTRUS PUNCTATUS, (Linné) Poey.

BUTTER-FISH or CONEY (*yellow variety*); NIGGER-FISH (*red variety*).

Carauna, MARCGRAVE, Hist. & c. Brasil, 1648, 147.—LICHTENSTEIN, Abhandl. Akad. Berl. 1820-1, 278.

Perca marina puncticulata (Negro-fish), CATESBY, Nat. Hist. Carolina, Florida, and Bahamas, ii, 1743, 7, pl. vii.

Perca punctata, LINNÉ, Syst. Nat. ed. 10, i, 1758, 291; ed. 12, 1766, 485 (on Catesby's figure).

Enneacentrus punctatus, POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 288.

Guatirere, PARRA, Descr. Dif. Piez. Hist. Nat. Cuba, 1787, 7, lam. v, f. 1, 2.

Holocentrus auratus, BLOCH, Ichth. vii, 1792, 57, tab. cccxxvi.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 314.

Gymnocephalus ruber, SCHNEIDER, op. cit. 346, tab. lxxvii (on a figure by Prince Maurice).

Serranus ouatalibi, CUV. & VAL., Hist. Nat. Poiss. ii, 1829, 381.—STORER, Syn. Fish. N. Am. 1846, 56.—GUICHENOT, Sagra's Hist. Nat. Cuba, Poiss. 1845, 15.—MÜLL. & TROSCHE, Schomburgh's Hist. Barbados, 1848, 665.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 120.—POEY, op. cit. 202.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 446.

Epinephelus ouatalibi, GILL, Proc. Acad. Nat. Sci. Phila. 1865, 105.

Bodianus guatirere, SCHNEIDER, Syst. Ichth. Bloch, 1801, 336 (on Parra's figures).

Serranus guatirere, CUV. & VAL., op. cit. 383 (limited to Parra's f. 2).—STORER, l. c.—MÜLL. & TROSCHE, l. c.—COPE, l. c.

Serranus carauno, CUV. & VAL., op. cit. 384 (on a drawing by Prince Maximilian).—CASTELNAU, Anim. Nouv. ou Rares, Amérique du Sud, Poiss. 1, pl. 1, fig. 1.

Common; recorded also from the West Indies, Brazil, and the Cape Verde Islands. Its small size and the softness of its flesh render it of little economic value. In this species, as in the preceding, the range of color is very great; some individuals are orange-yellow, with blue

spots confined to the head and anterior part of the body; others are red, slightly dingy above, and thickly studded throughout with black dots, each of which has a blue center. The specimens examined were not very fresh; and, from the rapidity with which the colors change, I can readily believe that in life they were as brilliant as is indicated in the description of Cuvier.* The yellow form corresponds to the typical *Perca punctata* or *Serranus quatrivere*, and is known as the Butter-fish or Yellow Coney; the red form corresponds to *Serranus ouatalibi*, and is known as the Nigger-fish.

Professor Poey suggests that the former inhabits shallow and the latter deep waters, and thus explains the variations of color. These would seem, however, to depend more upon the color of the bottom than upon the depth. On the coast of Maine, the bright-red variety of the Cod (*Gadus morrhua*, Linné) is found only on bottoms covered with Red Algæ, such as *Ptilota serrata*, *Delesseria sinuosa*, and *Rhodymenia palmata*.

The names Butter-fish and Nigger-fish are in use also at Barbados, Saint Thomas, and the Bahamas, as applied to this and an allied species. The first refers to the color and soft, oily feeling of the yellow variety; the latter probably also to color.

The Black Hind, Prickly Hind, and Black Coney are probably allied species, but not having seen them I can only surmise their character.

A "Soap-fish" also occurs, probably either *Rhypticus saponaceus* (Bloch) Cuvier, or *Promicropterus maculatus* (Holbrook) Gill.

HYPOPLECTRUS PUELLA, (Cuvier) Gill.

CATAPHEBE.

Plectropoma puella, CUV. & VAL., Hist. Nat. Poiss. ii, 1829, 405, pl. xxxvii.—GUICHENOT, Sagra's Hist. Nat. Cuba, Poiss, 1845, 18.—STORER, Syn. Fish. N. Am. 1846, 31.—POEY, Mem. Hist. Nat. Cuba, i, 1852, 62, lam. ix, f. 2.—GÜNTHER, Cat. Fish. Brit. Mus. i, 1861, 165.

Hypoplectrus puella, GILL, Proc. Acad. Nat. Sci. Phila. 1862, 236.—POEY, Rep. Fis.-Nat. Cuba, ii, 1858, 290.

Plectropoma vitulinum, POEY, Mem. Hist. Nat. Cuba, i, 1852, 68.

Common in the rock-pools; recorded also from Martinique and Jamaica. My specimen measures three inches. The name seems to be peculiar to Bermuda, and its origin is not apparent.

Color.—Olive, with six violet-black cross-bands; the third very broad and conspicuous and below the fourth and tenth dorsal spines. A line

* Cuvier and Valenciennes, Histoire Naturelle des Poissons, ii, 351

around the orbit, another from posterior nostril across anterior edge of orbit to lower limb of preoperculum, then broken, then continued to base of ventral; and two others across the operculum; the anterior extending over the base of pectoral to belly, blue. Several blue spots between the orbit and snout. Fins yellowish.

ECHENEIDIDÆ.

Fishes of this family are frequently taken, clinging to sharks or to the shells of turtles.* The sharks thus encumbered are frequently much emaciated. *Leptecheneis naucrates* (Linn.) Gill, *L. naucrateoides* (Zuiew) Gill, and *Ptheichthys lineatus* (Menz.) Gill are probably the most common species of "Suck-fish" found here.

SPHYRÆNIDÆ.

SPHYRÆNA SPET, (Häüy) Goode.

BARRACUDA.

Esox dorso dipterygio LINNÉ, Mus. Ad. Fried. ii. 1754, 100.

Esox sphyraena, LINNÉ, Syst. Nat. ed. 10. i. 1758, 313, ed. 12; i. 1766, 115; GMELIN, Linné, Syst. Nat. i. 1788, 1329.—BLOCH, Ichth. xi, 1797.

Sphyrna sphyraena, BLOCH, Ichth. 1797, taf. cccxxxix.—SCHNEIDER, Bloch, Syst. Ichth. 1801, 109.—Risso, Ichth. Nice, 1810, 332.

Esox spet, HAÜY, Encyclopédie Méthodique, iii, Poissons, 7187.

Sphyraena spet LACÉPÈDE, Hist. Nat. Poiss. v, 1803, 326-8.—? BONAPARTE, Iconografia della Fauna Italica, iii, Pesci, plate with part 152.

Sphyraena becuna, LACÉPÈDE, op. cit. 327-9, pl. ix, f. 1.—CUV. & VAL., Hist. Nat. Poiss. iii, 1829, 340 (part); and vii, 1831, 507.

Sphyraena vulgaris, CUV. & VAL., op. cit. iii, 1829, 327.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 334.

Sphyraena viridensis, CUV. & VAL., sc., op. cit. 339.

Common; frequently found in the markets, and eaten with impunity, as far as I could learn. My specimens measured nearly two feet, and it is said to attain a much greater size. This is not the Barracuda of the West Indies, but the common species of the Mediterranean known by the Spanish as *Espeto* and by the Italians as *Sfìrena* and *Luzzo*. Its occurrence so far west has, I believe, never before been observed. Günther

* All four species of the pelagic turtles of the Atlantic are common, and were observed by me, viz:—*Sphargis coriacea*, *Chelone mydas*, *Eretmochelys imbricata*, and *Thalassochelys caouana*. These, with a small saurian, *Eumeces longirostris*, Cope, make up the reptilian fauna of the Bermudas.

considers the *Sphyrana borealis* of DeKay,* described from specimens eight inches long taken in New York Harbor, to be the same. This might be inferred from the somewhat loose language of the description; but the figure shows it to be closely allied to, if not identical with, *Sphyrana picuda*. The origin of the first dorsal is shown by the artist to be situated almost directly above the extremity of the pectorals and far in front of the middle of the fish. The locality, New York, given by Dr. Günther for his specimen "purchased of Mr. Brandt" must, I fear, be placed in the same category with that of Lake Champlain given for specimens of *Chilomycterus geometricus* and *Tetrodon turgidus*,† and with some of the cases of reptiles described as North American by Duméril and Bibron from collections professedly North American.

SPHYRÆNA PICUDA, *Schneider*.

SENNET.

Barracuda, SLOANE, Voyage aux îles de Madère et de la Jamaïque, ii, 1727, 185, pl. cexlvii, f. 3.

Umbla minor marina maxillis longioribus (*Barracuda*), CATESBY, Hist. Carolina, Florida, and the Bahamas, ii, 1743, 1, tab. 1.

Picuda, PARRA, Deser. Dif. Piez. Hist. Nat. Cuba, 1787, 90, lam. xxxv, f. 2.

Sphyrana sphyrana, var. *picuda*, SCHNEIDER, Bloch, Syst. Ichth. ed. 1801, 110, tab. xxix, f. 1.—MÜLLER & TROSCHEL, Schomburgk's Hist. Barbados, 1848, 667.—GÜNTHER, Cat. Fish. Brit. Mus. ii, 1861, 336.

Esox barracuda, SHAW, Gen. Zool. v, 1804, 105.

Sphyrana barracuda, CUV. & VAL., Hist. Nat. Poiss. iii, 1829, 343, pl. lxvi.—STORER, Syn. Fish. N. A. 1846, 47.—MÜLLER & TROSCHEL, l. c.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 472.

Common; breeding plentifully. The young may be seen basking in the sun in the shallows, where they are seined in large numbers. My largest specimens measured over two feet in length. Both this and the preceding species are eaten with impunity, though the former is regarded with suspicion on the Mediterranean and the latter has to answer for several well-attested cases of *ciguatera*, though in some of the West India Islands it is eaten freely.

The popular name is also in use at Barbados, where it is applied to the same or an allied species. Schomburgk spells it *Sinnet*.

The species of this genus are not yet very accurately defined. Professor Cope‡ takes exception to the supposed identity of *S. picuda* and

* Zoology of New York, Fishes, 39, pl. lx, f. 196.

† Cat. Fish. Brit. Mus. viii, 285.

‡ Proc. Amer. Phil. Soc. Phila. 1870, 472.

S. barracuda. The latter may be easily distinguished from the preceding by observing the situation of the first dorsal. In *S. spet*, this begins in the middle of the body and far behind the extremity of the pectorals; in *S. picuda*, on the anterior half of the body and above the extremity of the pectorals. The first is much the slenderer, and has nearly double the number of scales in the lateral line.

TRACHYPTERIDÆ.

REGALECUS GLADIUS, (Walbaum) Cuv. & Val.

Spada marina, IMPERATI, 587.

Cepola gladius, WALBAUM, Artdi Gen. Pisc. iii, 1792, 617.

Regalecus gladius, CUV. & VAL., Hist. Nat. Poiss. x, 1835, 352, pl. cexcviii—GÜNTHER, Cat. Fish. Brit. Mus. iii, 1861, 308.—HURTON, Fishes of New Zealand, 35.

Gymnetrus longeradius, RISSO, Hist. Nat. Eur. Merid. iii, 1827, 296.

† *Gymnetrus capensis*, CUV. & VAL., op. cit. 376.

Regalecus Jonesii, NEWMAN, Zoologist, 1860, 7019.

This is the great "Sea-serpent" which came ashore at Hungary Bay in the winter of 1860, the capture of which has been recorded by Mr. J. Matthew Jones.*

Portions of this specimen, which measured 16 feet and 7 inches in length, are preserved in the British Museum.

This specimen is thought by Günther to "probably belong" to the species given above. The well-identified specimens of the species are all from the Mediterranean, the largest $9\frac{1}{2}$ feet long, while the relations of the specimens from New Zealand and the Cape of Good Hope are conjectural. The data are not sufficient to warrant the adoption of Newman's species, founded on the Bermuda specimen as a good one.

MUGILIDÆ.

MUGIL LIZA, Valenciennes.

MULLET.

Mugil liza, CUV. & VAL., Hist. Nat. Poiss. xi, 1836, 86.—JENYNS, Zool. Voyage H.

M. S. Beagle, Fish, 80.—GÜNTHER, Cat. Fish. Brit. Mus. iii, 1861, 423.—

POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 388

Very common, especially in Hamilton Harbor and other shallow bays; breeding. They are seined, and brought to market in large numbers.

* Bermuda Royal Gazette, Jan. 24 and Jan. 31, 1860.—Proc. Zool. Soc. London, 1860, 185.

I have some hesitation in referring the Bermuda Mullet to this species, though it appears to be identical with that taken at Bahia Blanco and Monte Video by Darwin and described by Jenyns.* Poey considers his *Mugil lebranchus*† separated from this species by characters of doubtful value.

BELONIDÆ.

The Hound-fish of the fishermen is a *Belone*; but as I could get no specimens for careful examination, it is not possible to say to which of the nineteen West India species it belongs, or whether two or three species are not confounded under the same name.

SCOMBERESOCIDÆ.

HEMIRHAMPHUS PLEII, Valenciennes.

GAR-FISH.

Hemirhamphus Pleii, CUV. & VAL., Hist. Nat. Poiss. xix, 21, 1846.—GÜNTHER, Cat. Fish. Brit. Mus. vi, 268.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 481.

Common; recorded also from various points in the West Indies and from Bahia. The Gar-fish occurs in enormous schools, and is seined in quantity for the market. I observed two sizes, the smallest averaging eight inches, the larger twenty inches. The fish of different sizes swam in separate schools.

The name *Gar*, applied so indiscriminately to fishes with long slender beaks, is probably the old Saxon word *gar*, which means a weapon, a lance. The name Half-beak usually given to fishes of this family is much more appropriate.

EXOCETUS EXILIENS, Gmelin.

Exocetus exiliens, GMELIN, Linné, Syst. Nat. 1, 1788, 1400.—CUV. & VAL., Hist. Nat. Poiss. xix, 1846, 114.—RICHARDSON, Fauna Boreali-Americana, iii, 129.—GÜNTHER, Cat. Fish. Brit. Mus. vi, 1861, 291.—GILL, in Baird's Rep. on Sea Fisheries of Southern New England, 809.

Exocetus fasciatus, LESUEUR, Journ. Acad. Nat. Sci. Phila. ii, 1821, 8, pl. iv, f. 2.

A single specimen was brought me March 1 by some negro fishermen who had caught it in Hamilton Harbor by holding a tin pail ("kettle") under it when it leaped from the water. I kept it alive for some hours,

* Zool. Voyage H. M. S. Beagle, Fish, 1842, 80.

† Memorias sobre la Historia Natural de la Isla de Cuba * * * ii, 1861, 260, tab. 18, f. 3; Rep. Fis.-Nat. Cuba, ii, 1868, 388.

and had an opportunity to observe its motions. Its favorite position was on the bottom of the dish, where it would remain with its pectorals and ventrals widely expanded, looking very like a large butterfly sunning itself on a flower. When disturbed, it would fold its fins close to the sides of its body, and swim about with great velocity by rapid, long, sweeping strokes of the tail and posterior half of the body. The extent to which it flexed its body was quite remarkable, almost reminding one of the motions of a Shark. When much excited, it would rise into the air with a sudden spring, its pectorals and ventrals expanded, seeming to have no difficulty in leaving the water in a space less than a foot in diameter: I am inclined to believe that the impetus from the action of the caudal is all that is used in leaving the water, and that the motion of the pectorals in flying-fishes is not begun until the fish is fairly in the air. It seemed very timid and watchful, and any quick motion of the hand within its sight would start it into rapid, nervous action.

The figures given by Lesueur and Edwards* are very accurate; but all published descriptions fail to mention the most striking character, viz, the deep notch in the membrane between the second and third pectoral rays, which seems the more apparent from the fact that the second ray is longer than the third, and projects in a spine-like process; the membrane between the third and fourth rays is slightly emarginate. The fourth ray is much the longest and the rays posterior to that regularly decrease in length.

The Bermuda fishermen recognize two kinds of flying-fish, the pelagic variety and this, which they believe to live among the sea-weed and seldom leave the water. The specimens of this species on record are all quite small: Gmelin describes his as "*at vir digito longior*"; Lesueur's was three inches long; Valenciennes's was "*petite*"; and Edwards's figure indicates that his was diminutive. They may prove to be the young of some other species; but this is not probable, since no other form has pectorals of such peculiar form. The absence of barbels, if this be a character of immature *Exocoetidae*, is also noteworthy.

A detailed description is given below:—

Radial formula: D. 12; A. 12; P. 18; V. 6; L. lat. 48.

The body is slender, its height being less than one-eighth (0.12) of the total length. Viewed from above, its outline is that of a narrow wedge, with its base at the nape and its apex at the extremity of the lower caudal lobe. The greatest width of the body is at the nape, where it is

* Gleanings in Natural History, pl. ccx.

equal to the greatest height, which occurs at the same point. The length of the head is one-sixth (0.17) of total length, and its greatest width equals that of the body. The orbit is circular, and its diameter equals the interorbital space, which is half the length of the head. The snout is very short, equaling one-sixth the length of the head; the lower projects far beyond the upper jaw. The interorbital space is deeply concave. The dorsal and anal fins begin at a point slightly behind the middle of the body, and are nearly alike in shape and in the length of the base and of the longest rays. The pectorals measure three-fifths (0.58) of the total length, extending nearly to the base of the caudal fin. The first ray is half as long as the second, which projects far beyond the margin of the membrane in a spine-like process; the third ray equals the second, while the fourth is much longer. The membrane between the second and third rays is deeply, between the third and fourth slightly, emarginated. The rays succeeding the fourth gradually decrease in length. The ventrals begin slightly in advance of the middle of the body, in length equaling a third (0.31) of total length. The five posterior rays are bifid nearly to the base. The tips of ventral and pectoral fins are equidistant from the snout. The upper lobe of the caudal measures two-thirds the length of the lower lobe.

Color.—Back bluish, shading into the silvery white of the belly; five broad lateral transverse bands. The snout transparent white. Two yellow spots upon the nape. Pectorals and ventrals black at base and at margin, and with broad, irregular bands and blotches of black and dark blue; where unspotted, clear, colorless, and transparent. Caudal lobes each with a terminal spot of black; the lower with spot of same color on its outer margin half-way from the body to its extremity.

| | |
|---|-----|
| Extreme length, 0 ^m .073 | 100 |
| Body: | |
| Greatest height | 12 |
| Greatest width | 12 |
| Height at ventrals | 10 |
| Height of tail behind dorsal fin | 06 |
| Head: | |
| Length | 17 |
| Distance from snout to nape | 15 |
| Greatest width | 12 |
| Width of interorbital area | 10 |
| Length of snout | 03 |
| Eye: | |
| Diameter | 08 |

Dorsal :

| | |
|--------------------------|-----|
| Distance from snout..... | .56 |
| Length of base..... | .13 |
| Greatest height | .13 |

Anal :

| | |
|--------------------------|-----|
| Distance from snout..... | .56 |
| Greatest height | .14 |

Caudal :

| | |
|---------------------------|-----|
| Length of upper rays..... | .15 |
| Length of lower rays..... | .23 |

Pectoral :

| | |
|---|-----|
| Distance from snout at upper axilla | .16 |
| Length | .58 |
| Distance of tip from snout..... | .80 |

Ventral :

| | |
|----------------------------------|-----|
| Distance of base from snout..... | .45 |
| Length | .32 |
| Distance of tip from snout..... | .78 |

The *Exocetus exiliens* of Bloch is totally different.

I observed numerous specimens of the pelagic species in the vicinity of the islands, both on going and return. I take from my note-book some observations on their flight.

"February 10, 1871.—Several flying-fishes were observed on approaching the islands; usually they were single, but often a school of half a dozen or more started out from under the side of the brig. The distance of flight varied from six to one hundred yards. When they leave the water, the pectorals assume a rapid vibration, reminding one of the flight of a grouse, the tail also rapidly vibrating. The fins soon assume a rigid position, and the fish rises over the crests and falls in the trough of the waves, following their motion; sometimes it dashes through the crest, and on re-appearing the fins are again in motion. They seem unable to fly except in a straight line (I afterwards saw them veering considerably from a straight line, taking a direction nearly at right angles with their first course), but are not dependent on the direction of the wind. The motion is very bird-like, but the illusion is dispelled by the decidedly piscine splash with which the fish plunges into the water. It was a truly beautiful sight as the fishes emerged from the waves, their silvery fins quivering and glistening in the light."

I am convinced that at the moment the fish leaves the water the mode of propulsion changes from a true swimming motion to a true flying motion. The leap with which it leaves the water is due to the former, and is analogous to the spring from the ground or from a perch, made by some birds in the act of taking wing.

CYPRINODONTIDÆ.

FUNDULUS BERMUDÆ, *Günther*.

Fundulus Bermudæ, GÜNTHER, Ann. & Mag. Nat. Hist., 1874.

Very common in the brackish water of the swamps and in ditches. Attains the length of four inches.

SYNODONTIDÆ.

SYNODUS LACERTA, (*Valenciennes*) *Goode*.

SNAKE-FISH.

Salmo Saurus, LINNÆ, Syst. Nat. 2 ed. 11, 511, 1766; Gmelin, Syst. Nat. 1, 1376.

Saurus lacerta, CUV & VAL., Hist. Nat. Poiss. xxii, 463, 1849 (not Risso).

Saurus griseus, LOWE, Trans. Zool. Soc. ii, 188, 1841.—GÜNTHER, Cat. Fish. Brit. Mus. v, 395.

A specimen, seventeen inches long, was taken off the "ducking-stool" in March, by a line fisherman. Its occurrence in this part of the Atlantic is very novel, but it agrees closely with a specimen of *Saurus griseus* sent to the United States National Museum by Dr. Günther. Its color was dusky-gray above, yellow below. Its formulæ are as follows:—

Branchiostegals, 16–17 (on opposite sides). D. 12; A. 12. Lateral line, 60. Transverse line, $\frac{3\frac{1}{2}}{6}$.

ELOPIDÆ.

MEGALOPS THRISOIDES, (*Bloch*) *Günther*.

TARPUM.

Camaripucuagu, MARCGRAVE, Hist. &c. Brasil, 1648, 179.

Clupea cyprinoides, BLOCH, Ichth., xii, 1797, 24, tab. cecicii.

Clupea thrissoides, SCHNEIDER, Bloch, Syst. Ichth. 1801, 424.

Megalops thrissoides, GÜNTHER, Cat. Fish. Brit. Mus. vii, 1868, 472.—GILL, in Baird's Rep. on Sea Fisheries of Southern New England, 1873, 810.

Clupea apalike, HAÜY, Encyclopédie Méthodique.—LACÉPÈDE, Hist. Nat. Poiss. v, 1803, 425, 461.

Clupea gigantea, SHAW, Gen. Zool. v, 1803, 173.

Megalops atlanticus, CUV. & VAL., Hist. Nat. Poiss. xix, 1846, 398.—MÜLLER & TROSCHEL, Schomburgk's Hist. Barbados, 1848, 676.—POEY, Rep. Fis.-Nat. Cuba, ii, 1868, 423.

Extremely rare; a single skin about six feet long was shown me in the collection of John T. Bartram, of Saint George's. The species

is recorded from the Gulf of Mexico, Demerara, Trinidad, Guadaloupe, Santo Domingo, Porto Rico, Martinique, and Cuba.

The species is very abundant on the eastern coast of Florida and in the Saint John's River, where it is known as the Jew-fish. Several specimens were taken on the southern coast of New England and New York in 1874.

The name is inexplicable, but may have some connection with the name "Caffum", which is given to the same fish in Barbados.

CLUPEIDÆ.

SARDINELLA ANCHOVIA, *Valenciennes*.

ANCHOVY.

Sardinella anchovia, CUV. & VAL., Hist. Nat. Pois. xx, 1847, 269.

Clupea anchovia, GÜNTHER, Cat. Fish. Brit. Mus. vii, 1868, 421.

I refer with some doubt to this species a small fish which occurred in great schools during the month of March, and were seined together with *Decapterus punctatus*, and sold in quantities along the quay. Their average length was about five inches.

HARENGULA MACROPHTHALMA (*Ranzani*).

PILCHARD.

Clupea macrophthalma, RANZANI, Novi Commentarii Acad. Scient. Inst. Bononiensis, v, 1842, 320, tab. xxiii.—GÜNTHER, Cat. Fish. Brit. Mus. vii, 1868, 421.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 483.

Harengula sardina, POEY, Mem. Hist. Nat. Cuba, ii, 1863, 310; Rep. Fis.-Nat. ii, Cuba, 1868, 418.

Common; also recorded from various islands in the West Indies. Great quantities were seined during the month of March, and sold from row-boats at the water's edge. Their average length was nine inches. Poey's *Harengula sardina* appears to be the same. The name is derived from England, where an allied species, *Clupea pilchardus*, Walbaum, is commonly known as "the Pilchard".

OPISTHONEMA THRISSA, (*Linné*) *Gill*.

HERRING.

Clupea minor, radio ultimo pinnæ dorsalis longissimo, BROWN, Civ. and Nat. Hist. Jamaica, 1756, 443.

? *Clupea corpore ovato*, LINNÉ, Amœn. Acad. v, 251.

- Clupea thrissa*, LINNÉ, Syst. Nat. ed. 10, 1, 1758, 318; ed. 12, 1, 1750, 524; GMELIN, Linné, Syst. Nat. 1, 1788, 1405 (part).—BROUSSONET, Ichth. 1, tab. x.—?BLOCH, Ichth. xii, 1797, 27, taf. ccciv (from a drawing by Plumier).—SCHNEIDER, Bloch, Syst. Ichth. ed. 1801, 424.—GÜNTHER, Cat. Fish. Brit. Mus. vii, 1868, 432.
- Meletta thrissa*, CUV. & VAL., Hist. Nat. Poiss. xx, 1847, 380.
- Opisthonema thrissa*, GILL, Proc. Acad. Nat. Sci. Phila. 1861, 37; Cat. Fish. E. Coast N. Am. 1861, 54; and in Baird's Rep. on Sea Fisheries of S. New England, 1872, 811.
- Opisthonemus thrissa*, POEY, Rep. Fis. Nat. Cuba, ii, 1886, 419.
- Clupanodon thrissoides*, SPIX, MÜLL., & TROSCHE, Schomburgk's Hist. Barbados, 1848, 676.
- Megalops thrissoides*, AGASSIZ, in Spix's Selecta Gen. et Spec. Pisc. Brazil, 1829, 45, pl. xxii.
- Megalops oolina*, LESUEUR, Journ. Acad. Nat. Sci. Phila. 1, 1817, 359.
- Chatoessus oolina*, GRIFFITH, Cuvier's Animal Kingdom, x, 1835, 439.—DEKAY, New York Fauna, Fishes, 1842, 265.—STORER, Syn. Fish. N. Am. 1846, 209.
- Chatoessus signifer*, DEKAY, op. cit. 264, pl. xli, f. 132.—STORER, op. cit. 210.—BAIRD, Fishes of New Jersey Coast, 1855, 35.—JONES, Naturalist in Bermuda, 103.
- Chatoessus eumorphus*, GOSSE, Naturalist's Sojourn in Jamaica, 1851, 290 (notes).

This species was taken in great numbers during the month of March. They occurred in schools in two distinct sizes; the smaller, perhaps the young of the previous year, measured four inches on an average; the adults, ten. The species is common in the West Indies, and has been taken as far north as Newfoundland.

ENGRAULIDIDÆ.

ENGRAULIS CHÆROSTOMUS, Goode.

HOG-MOUTH FRY.

Engraulis chærostomus, GOODE, Amer. Journ. Science and Arts, viii, 1874 (Aug.), 125.

Common in the bays in large schools; used extensively for bait. Its enormous mouth has given it the name of "hog-mouth fry."

This species closely resembles *Engraulis surinamensis* (Blkr.) Günther, differing from it, however, in several respects. The height of the body (0.16) is a little greater than two-thirds of the length of the head, and is contained six times in the total length, and slightly more than four times in the length to the end of middle caudal rays (0.90); the height at the ventrals is less (0.13). The scales are large, in thirty-eight oblique rows between the head and the caudal. The length of the head (0.22) is less than one-fourth of the total, and is double its height at the pupil (0.11); its greatest width (0.08) is about one-third of its

length. The orbit is nearly circular, and its diameter (0.05) equals the length of the snout (0.05) and the width of the interorbital area (0.05). The snout projects far beyond the lower jaw, the extremity of which just passes the vertical from the anterior margin of the orbit. The maxillary is dilated above the mandibular joint, rather tapering behind, and extends to the gill-opening. The gill-rakers are fine, setiform, not longer than the eye (0.05); about twenty-five on the lower branch of the outer branchial arch.

The origin of the dorsal fin is in front of the middle of the body (0.45 from the snout), and directly above the extremities of the ventrals. The length of the first ray (0.06) is half that of the second (0.12), which nearly equals the length of the base (0.11). The origin of the anal is at the middle of the body (0.51 from the snout), and below the posterior dorsal rays; its greatest height (0.11) nearly equals that of the dorsal. The length of the middle caudal rays (0.08) is two-fifths of that of the outer rays (0.20). The length of the pectorals (0.11) equals the length of the base of the dorsals (0.11), the extremities reaching to the origin of the ventrals. Length of ventrals, 0.09; and their distance from snout, 0.35.

Color:—Back and sides brownish; belly white; a broad, clearly-defined lateral band of silver as wide as the diameter of the orbit (0.05).

Radial formula:—D. 13-14, A. 23-24. Length, 2.68 inches (0^m.63).

CYPRINIDÆ.

CARASSIUS AURATUS, (*Linné*) *Bleeker*.

GOLD-FISH.

Cyprinus auratus, LINNÉ, Syst. Nat. ed. 10, i, 1758, 323.—JONES, Naturalist in Bermuda. 1863, 103.

Carassius auratus, BLEEKER, Cyprin. 255.—GÜNTHER, Cat. Fish. Brit. Mus. vii, 1868, 32,

Common in the brackish water of the ditches. Mr. Jones states that it was introduced from Demerara many years ago.

ANGUILLIDÆ.

ANGUILLA BOSTONIENSIS, (*Lesueur*) *Ayres*.

EEL.

Muræna bostoniensis, LESUEUR, Journ. Acad. Nat. Sci. Phila. i, 1817, 81.

Anguilla bostoniensis, AYRES, Boston Journ. Nat. Hist. iv, 1842, 279.—GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 31.—GILL, in Baird's Rep. Sea Fisheries Southern New England, 1873, 811.—BAIRD, Rep. Sea Fisheries Southern New England, 1871, 826.

Common in the ditches and dikes of the salt-marshes. Mr. Jones states* that it attains the weight of two or three pounds, and is very destructive to young ducklings. It is not eaten.

I obtained a specimen measuring five inches, which I refer with some hesitation to the above species, as measurements made from specimens contracted by strong alcohol are not satisfactory. The length of the head is contained once and a half in the distance between the gill-opening and the dorsal, twice in the distance between the gill-opening and the vent. The distance between the origins of the dorsal and anal is contained once and a half in the length of the head.

MURÆNIDÆ.

GYMNOTHORAX MORINGA, (Cuvier) Goode.

SPECKLED MARAY.

Murena maculata nigra (Black Murey), CATESBY, Nat. Hist. Carolina, Florida, and Bahamas, ii, 1743, 21, tab. 21, 174.

Murana moringa, CUVIER, Règne Animal, 1817.—STORER, Syn. Fish N. Am. 1846, 235

Murana moringua, RICHARDSON, Voy. H. M. S. S. Erebus & Terror, Ichth. 1846, 89.—KAUP, Cat. Apod. Fish. Brit. Mus. 1856, 89.

Gymnothorax rostratus, AGASSIZ, in Spix's Selecta Gen. et Spec. Brasil, 1829, 91, tab. 1, a.—MÜLL & TROSCHE, Schomburgk's Hist. Barbados, 1848, 676.—POEY, Rep. ii, 1860-1, 259, 427.—COPE, Trans. Am. Phil. Soc. Phila. 1870, 483.

Murenophis rostratus, CASTELNAU, Anim. Nouv. ou Rares, Amérique du Sud, 1855, 80, pl. xlii, f. 1.

Murenophis curvilineata, CASTELNAU, op. cit. 81, pl. xlii, f. 2.

Occasional: the species occurs throughout the West Indies, at Bahia and at Saint Helena. My specimen measures three feet, and has the vertical fins edged with white. These fishes are said to attain a length of five or six feet, and are considered excellent food by the lower classes: I am told, however, that serious cases of poisoning have been occasioned by their use. The Speckled Maray is not rare, but by no means as common as the Green Maray. I saw a single specimen of the latter, but as I could not obtain it for study I was unable to determine its specific relations. It resembles closely the "Muray" of Catesby,† which I have reason to believe is not identical with his "Black Muray", as is generally supposed.

* Naturalist in Bermuda, p. 103.

† Nat. Hist. Carolina, Florida, and Bahamas, 20, pl. xx—*Murana maculata nigra* and *viridis*.

ECHIDNA CATENATA, (Bloch) Bleeker.

Gymnothorax catenatus, BLOCH, Ichth. xii, 1797, 69, taf. ccccxv.

Murena catenata, RICHARDSON, Voyage H. M. S. S. Erebus & Terror, Ichth. 1846, 95.—

GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, 131.

Pacilophis catenatus, KAUP, Cat. Apod. Fish. Brit. Mus. 1856, 100.

Echidna catenata, BLEEKER, Ned. Tyds. Dierk. ii, 242.

Dr. Kaup (*l. c. sup.*) gives Bermuda as a locality for this species; it also occurs at many of the West India Islands, at Trinidad, and on the coast of Dutch Guiana at Surinam.

RAIÆ.

The names Sting Ray and White Ray would indicate the occurrence of one or more species of this order. *Ætobatis narinari* (Euphrasen) Müll. & Henle is likely to occur here.

LAMNIDÆ.

Mr. Jones records a specimen nearly eight feet long taken in March, 1850, which he believes to be the *Lamna punctata* figured by DeKay.*

SPHYRNIDÆ.

The Hammer-head Shark known to the fishermen is probably the *Sphyrna zyggæna* (Linné) Müller & Henle.

SCYLLIIDÆ.

The large Shark confined in the Devil's Hole is probably *Ginglymostoma cirratum* (Gmelin) Müll. & Henle.

GALEORHINIDÆ.

MUSTELUS CANIS, (Mitch.) DeKay.

NURSE SHARK.

Squalus canis, MITCHILL, Trans. Lit. and Phil. Soc. N. Y., 1, 486, pl. lxiv, f. 209.

Mustelus canis, DEKAY, Zool. N. Y. Fish, 1842, 355, pl. lxiv, f. 209.—STORER, Syn. Fish.

N. Am. 253.—BAIRD, Fishes New Jersey Coast, 39, 1854; Rep. U. S. Com. Fish,

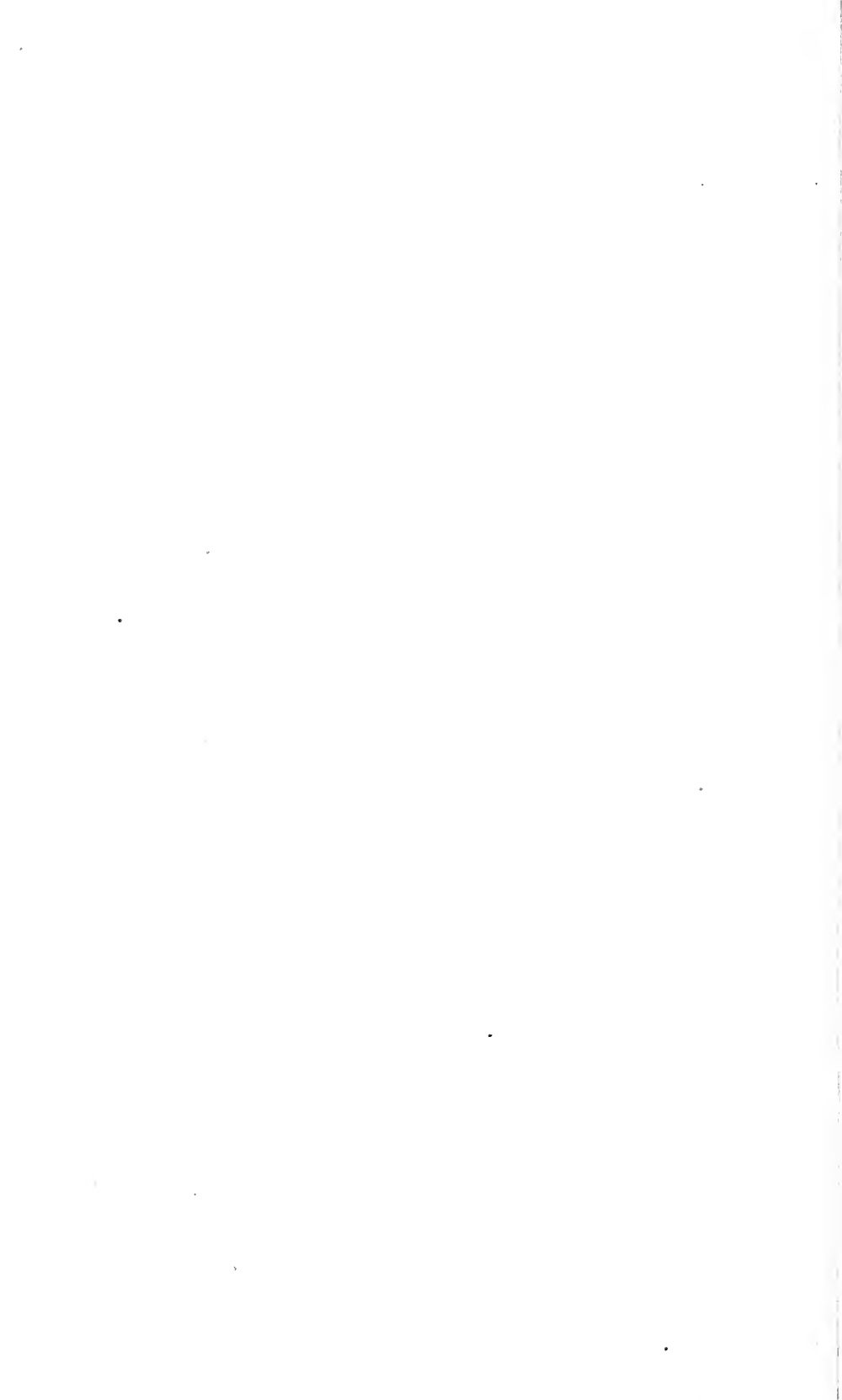
1871, 827.—GILL, Cat. Fishes E. Coast N. Am. 59; and in Baird's Rep. U. S.

Com. Fish, 1871, 813.—POEY, Rep. Fis.-Nat. Cuba, ii, 453.

Common. My specimen measured three feet, and one of the oviducts contained a young one eight inches long. It agrees exactly with specimens of *Mustelus canis* from Wood's Hole, Mass.

The Nurse is considered excellent food; after it has been boiled until tender, and then fried in its own fat. The sharks are rarely eaten, however, except by the negroes.

* Zoology of New York, Fish, 352, pl. lxiii, f. 206-207.



APPENDIX.

ADDITIONAL SPECIES OBSERVED BY MR. J. MATTHEW JONES.

After the preceding pages were in type, I received from Mr. Jones a list of the species collected by him in the Bermudas. In order to represent as fully as possible the present state of knowledge in reference to the fish fauna of these islands, I venture to give below the names of those species cited by Mr. Jones which have not fallen under my personal observation. Many species are of course included both in his collection and my own. The specific names below are given on the authority of Mr. Jones, who employs the nomenclature of Dr. Günther's "Catalogue of the Fishes in the British Museum".

LIST.

Diodon maculatus.
Tetrodon rostratus.
Ostracion trigonus.
Balistes maculatus.
Monacanthus aurantiacus.
Syngnathus Jonesii. *
Centriscus, sp.
Fistularia serrata.
Rhomboidichthys lunatus.
Hemirhombus aramaca.
Lefroyia bermudensis.
Brotula barbata.
Centronotus, sp.
Blennius crinitus.
Gobius soporator.
Scorpaena Plumieri.
Scarus Catesbyi.
Pseudoscarus psittacus.
*Pseudoscarus sanctæ-crucis.**

PlatyGLOSSUS bivittatus.
Glyphidodon caelestinus.
Acanthurus chirurgus.
Chaetodon capistratus.
Holacanthus tricolor.
Caranx dentex.
Caranx carangus.
Caranx chrysos.
Thyrsites prometheus.
Auxis Rochei.
Seriola Dumerilii.
Seriola zonata.
Trachynotus ovatus.
Coryphæna pelagica.
Coryphæna hippurus.
Mullus barbatus.
Sargus argenteus.
Mesoprion chrysurus.
Hæmulon macrostoma.

* [Probably the young of *Pseudoscarus vetula*; see discussion on page 32, *supra*.]

Hæmulon xanthopteron.
Serranus coronatus.
Rhypticus saponaceus.
Apogon imberbis.
Priacanthus macrophthalmus.
Regalecus gladius.
Belone hians.
Exocoetus lineatus.
Saurus fœtens.

Saurus myops.
Albula conorhynchus.
Ophichthys acuminatus.
Muræna miliaris.
Muræna maculipinnis.
Muræna sanctæ-helenæ.
*Acipenser sturio.**
Carcharias obscurus.
Ætobatis narinari.

* [??]

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Department of the Interior:

U. S. NATIONAL MUSEUM.

— 6 —

BULLETIN

OF THE

UNITED STATES NATIONAL MUSEUM.

No. 6.

PUBLISHED UNDER THE DIRECTION OF THE SMITHSONIAN INSTITUTION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

INTERNATIONAL EXHIBITION, 1876.

BOARD ON BEHALF OF UNITED STATES EXECUTIVE DEPARTMENTS.

CLASSIFICATION

OF THE

COLLECTION TO ILLUSTRATE

THE

ANIMAL RESOURCES OF THE UNITED STATES.

A LIST OF SUBSTANCES DERIVED FROM THE ANIMAL KINGDOM, WITH
SYNOPSIS OF THE USEFUL AND INJURIOUS ANIMALS
AND A CLASSIFICATION OF THE METHODS
OF CAPTURE AND UTILIZATION.

By G. BROWN GOODE, M. A

ASSISTANT CURATOR U. S. NATIONAL MUSEUM.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

ADVERTISEMENT.

This work is the sixth of a series of papers intended to illustrate the collections of Natural History and Ethnology belonging to the United States and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

JOSEPH HENRY,

Secretary Smithsonian Institution.

SMITHSONIAN INSTITUTION,

Washington, February, 1876.

P R E F A C E.

The following classification has been prepared by Mr. Goode to facilitate the work of collecting and arranging the material gathered by the National Museum to illustrate the resources of the United States as derived from the animal kingdom, in the International Exhibition of 1876. It is also intended to indicate the general character of the articles which are to be included in this branch of the exhibition.

Contributions of specimens of the different classes enumerated are much desired, for the purpose of making the proposed display complete, and should be addressed to the Smithsonian Institution, Washington, D. C.

JOSEPH HENRY,
Secretary Smithsonian Institution.

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INTRODUCTION.

The system proposed in the following lists has been hurriedly prepared, and is necessarily very incomplete; it is intended merely as a provisional classification, to be used in collecting the materials for the exhibition, and in their preliminary arrangement.

The first group, SECTION A, is an index to the whole series; it will include all North American animals which are directly beneficial or injurious to man. Although every species, down to the very least, exercises some influence upon human well-being, it seems scarcely practicable to attempt the exhibition of those which affect it only indirectly. Those species are considered useful which supply food, clothing, shelter, implements, materials, and amusement; those injurious which endanger the life or personal comfort of man, or destroy those animals and plants which are of direct benefit to him. In the enumeration of animals, the names of the orders are given, followed in parenthesis by the best-known names of the more important species included, and a brief note on their principal uses. This enumeration, being simply of convenience, makes no claim to zoological precision.

SECTION B embraces all instruments and methods employed by the hunters, trappers, and fishermen of North America, aboriginal and civilized. Not only those which are directly employed in destruction or capture are included, but the means made use of in pursuing or attracting the animals and fishes, and the personal equipment of the pursuer. The collection will be a monograph of *all* matters relating to the chase and the fisheries of the country. In preparing the classification here submitted, the principles of zoological classification have been followed as closely as possible; each distinct form has been considered a species; and the specific forms have been grouped into genera, families, and orders according to the general balance of their affinities. Form and manner of use have not been without weight, but superficial resemblance has been set aside, and the *idea* given the first importance. Thus, barbed spears and harpoons have been placed with the "hooked instruments," while plain spears and lances are grouped with the knives and clubs. In studying the place of the fire-arms and bows and arrows, the missile itself has been regarded as more important than the

machine which propels it, and the latter is placed in a subordinate relation.

In one group, that of nets, convenience in arrangement of the specimens seems to demand that *material*, a character of small importance, shall be made prominent. Two widely diverging groups of apparatus are associated under the head of nets, viz, encircling-nets, the true relations of which are with grasping and scooping instruments, and entangling nets which belong with the traps, where a third group of nets, the pound and weir nets are actually classed. Where the exigencies of administration of the specimens demand that they should be arranged otherwise than in their exact systematic position, full cross-references are given.

The simplest implements have always been placed first, the series advancing in the order of complication of structure. Thus we have in the beginning the apparatus of direct application, or tools, including, first, those implements which are used in the hand, and which increase its power in a simple way, such as clubs and slung-shot, which merely add to the weight of the fist, followed by the knives, axes, and spears, which in their simplest and primitive form were sharpened stones and pointed sticks. Second, are the grasping-implements, or those by which the power of the fingers is extended. In this series the same principle of progress from simple to complex is followed; in the scoop we have the idea of the hollow palm of the hand developed in various forms, while the grasping-hooks and grasping-lines are the artificial extensions of the human finger. Under hooked instruments, the simple hooks, or those which are attached to the object by a single motion, a pulling one, are placed first, followed by the barbed implements, in which the attachment is made by a thrusting, succeeded by a pulling motion, and then by the tongs and forceps, which are essentially double hooks. The succeeding division is that containing the lasso and bolas, which are worked at long distances and require great skill, succeeded by the tangles, which are, in principle, assemblages of lassos, entangling objects among their fiber nooses.

In the third division, that of missiles, the same principle of succession is adhered to. First are placed those missiles which are propelled by the unaided arm; then those in using which the arm is artificially lengthened, as with the sling, string, or darting stick; then those in which the propelling power is derived from the elasticity of rods and cords, the strength of the arm having become subsidiary; closing with those in

the use of which the strength of the arm is of no essential value, and the propelling power originates in chemical combustion.

Accessory to these are groups containing those articles used in the manufacture, testing, loading, and transportation of these missiles, and the machines which drive them through the air.

In a fourth division is the apparatus of angling, which is separated from hooked implements with which the form of the articles would naturally place them, since they are not implements of grasping, but partake of the nature of traps, being in part automatic.

The group of nets is a heterogeneous one, as has been stated above, consisting of two divisions, the first that of entangling-nets, belonging properly with traps, while encircling-nets are in idea instruments for grasping.

In arranging traps a logical succession has been preserved as far as possible. Those traps are considered the most simple in which the animal is penned by its own act, without any change in the arrangement of the trap. The pit-falls or "tipes" are first, followed by the mazes or labyrinths of greater or less complexity. Then come the traps in which the entrance is closed, either by the falling of a door or by the falling of a box-like trap, as a whole, so as to surround the animal. Under clutching-traps are placed those which seize the animal, as in the fingers, while crushing-traps are those which seize or impale it bodily. Adhesive preparations, such as bird-lime, close the series.

The accessory divisions, including hunting-animals, decoys, and disguises, and the methods and appliances of pursuit, do not admit any thorough classification, and are arranged with reference to convenience of exhibition.

SECTION C includes all methods of utilizing animals' products. It might be more satisfactorily arranged with the following section, were it not for the inconvenience of exhibiting models and tools in the same cases with the manufactured products; the arrangement of the two sections is nearly the same.

In SECTION D are grouped all useful substances derived from the animal kingdom. In order to avoid the omission of any products which are or may be obtained from North American animals, this enumeration has been made general, those not American being included in parentheses. This enumeration is far from complete, and is intended simply as an aid to future study in the same direction.

SECTION E includes all articles illustrating the culture and protection of useful animals.

SECTION A.

E N U M E R A T I O N

OF

ANIMALS BENEFICIAL OR INJURIOUS TO MAN,

(WITH A SYNOPSIS OF THEIR USEFUL APPLICATIONS.)

I. M A M M A L S.

I. FERAÆ:

FISSIPEDIA. (Cats, pumas, jaguars, ocelots, lynxes, wolves and dogs, foxes, fishers, martens, minks, weasels, wolverenes, badgers, skunks, otters, sea-otters, bears, raccoons, and the domesticated cat, dog, and ferret.)

Useful products :

Food, (bears, raccoon, &c.) D. 1.

Fur, (all the group.) D. 6.

Leather, (dog, cat.) D. 20.

Textile fabrics, felt, (raccoon.) D. 8.

Ivory, teeth, (bear, fox, &c.) D. 9.

Claws used by Indians, (bears, puma.) D. 11.

Hair, for brushes, (badger, dog, weasel, skunk, bear.) D. 21.

Oil, (bears.) D. 27.

Perfumes, (civet, &c.) D. 28.

Medicinal products, (skunk.) D. 30.

Chemical agent, *album græcum*, (dog.) D. 30.

Useful traits:

Susceptible of domestication, (wolves (Indian dog,) foxes, otters, bears, raccoon, dog, cat, ferret.)

Employed in hunting, (dog, cat, ferret.) B. 40.

Employed in fishing, (otter.) B. 40.

1. FERRAE—Continued.

FISSIPEDIA—Continued.

Injurious traits:

Enemies of man, (cats, wolves, bears.)

Enemies of domestic animals.

Marauders on crops, (bears, raccoon.)

Stench nuisances, (skunks.)

Modes of capture. B. I, II, III, VI, X.

PINNIPEDIA. (Fur-seals, sea-lions, hair-seals, hood-seals, sea-elephants, walruses.)

Useful products:

Food of aborigines. D. 1.

Fur, (fur-seals, &c.) D. 6.

Leather, &c., parchment from viscera, (sea-lions, hair-seals, walruses.) D. 20.

Oil, (hair-seal, hood-seal, sea-elephant, &c.) D. 27.

Ivory, (walrus.) D. 9.

Injurious traits: Destroy fish.

Modes of capture. B. I, III, V, X.

2. UNGULATA. (Bison, musk-ox, mountain-goat, mountain-sheep, antelope, moose, caribou, elk, deer, peccary, and the domesticated ox, goat, sheep, hog, horse, ass, and camel.)

Useful products:

Food, fresh, smoked, and pickled, (all the group.) D. 1, 2, 3.

Fur, (bison, musk-ox, goat, sheep, moose, &c.) D. 6.

Leather, (all the group.) D. 20.

Textile fabrics and felt, (ox, goat, sheep, camel, musk-ox.) D. 8.

Ivory and bone. D. 9.

Horn, (bison, ox, goat, sheep, deer, elk, &c.) D. 10.

Hoof, (bison, musk-ox, goat, sheep, deer, horse, &c.) D. 11.

Hair, bristles, and wool, (bison, ox, goat, sheep, deer, hog, camel.) D. 21.

Gelatine and glue. D. 4, 24.

Oil and fat. D. 27.

Perfumes, (musk-ox, musk-deer.) D. 28.

Coloring materials from blood and bile. D. 29.

2. UNGULATA—Continued.

Useful products:

Chemical products. D. 30.

Fertilizers. D. 31.

Useful traits: Susceptible of domestication.

Modes of capture. B. I, II, III, VI, IX.

3. PROBOSCIDEA. (Elephants.*)

Useful products: Ivory. D. 9.

4. SIRENIA. (Manatee, or sea-cow.)

Useful products:

Food. D. 1.

Leather. D. 7, 20.

Oil. D. 27.

5. CETE. (Whales.)

DENTICETE. (Beluga, narwhal, porpoise, b'ack-fish, killer, grampus, sperm-whale.)

Useful products:

Food, Indian, (sperm-whale, porpoise.) D. 1.

Oils, (all the group.) D. 27.

Spermaceti, (sperm-whale.)

Leather, (porpoise, beluga.) D. 7, 20.

Bone and ivory, (narwhal, sperm-whale.) D. 9.

Perfume, *ambergris*, (sperm-whale.)

Injurious traits: Destroy fish and seals.

Modes of capture. B. I, II, III, X.

MYSTICETE. (Right, or whale-bone whales.)

Useful products:

Food, (right-whale.) D. 1.

Baleen. D. 12.

Oil, (right-whale, &c.) D. 27.

6. CHIROPTERA. (Bats.)

Useful products:

Food, Indians. D. 1.

Felting material. D. 8.

Guano. D. 31.

Useful traits: Destroy troublesome insects.

Injurious traits: Disseminate troublesome insects.

* *Elephas primigenius*, found fossil in North America.

7. INSECTIVORA. (Moles and shrews.)

Useful products:

Fur, (moles.) D. 6.

Felting material, (moles.) D. 8.

Useful traits:

Destroy burrowing insects, &c.

Injurious traits: Burrowers.

Modes of capture. B. VI.

8. GLIRES. (Squirrels, prairie-dogs, showtl, marmots, musquash, beaver, rats, mice, lemmings, porcupines, rabbits, and the domesticated rabbit, and Guinea-pig.)

Useful products:

Food. D. 1.

Fur, (squirrels, showtl, marmots, musquash, beaver, lemmings, rabbit, &c.) D. 6.

Textile fabric, felt, (musquash, beaver, rabbit.) D. 8.

Ivory, (beaver.) D. 9.

Leather, (rat, beaver.) D. 7, 20.

Hair and down, (rabbits.) D. 21.

Quills, (porcupine.) D. 21.

Perfume, *castoreum*, (beaver.) D. 28.

Useful traits: Susceptible of domestication, (squirrels, rabbits, &c.)

Injurious traits: Marauders.

Modes of capture. B. I, II, III, VI, VII, VIII, IX.

9. BRUTA. (Armadillo, &c.)

Useful products: Shell used by Indians in various manufactures. D. 14.

Injurious traits:

Burrower.

Marauder.

10. MARSUPIALIA. (Opossum.)

Useful products:

Food. D. 1.

Hair used in felting. D. 8.

Injurious traits: Marauder.

Modes of capture. B. I, II, III, VI, VIII.

II. BIRDS.

11. PASSERES. (Thrushes, stone-chats and blue-birds, dippers, kinglets, titmice, nuthatches, creepers, wrens, larks, wagtails, warblers, tanagers, swallows, waxwings, greenlets, shrikes, finches, starlings, black-birds and orioles, crows and jays, fly-catchers, and domesticated sparrow, canary, &c.)

Useful products :

Foods, (thrushes, rice-birds, &c.) D. 1.

Ornamental feathers. D. 23.

Useful traits :

Destroy insects.

Song-birds, (generally susceptible of domestication.)

- 12-13. PICARIÆ AND CUCULI. (Night-hawks, whippoorwills, swifts, humming-birds, trogons, saw-bills, kingfishers, cuckoos, woodpeckers.)

Useful products : Ornamental feathers, (humming-birds, trogons.) D. 23.

Useful traits :

Destroy noxious insects, (night-hawks, swifts.)

Destroy tree-borers, (woodpeckers.)

Injurious traits :

Destroy fish, (kingfishers.)

Destroy birds' eggs, (cuckoos.)

Destroy fruit, (woodpeckers.)

Destroy trees, (sap-sucker.)

14. PSITTACI. (Parroquet and domesticated parrots.)

Useful products : Ornamental feathers. D. 23.

Useful traits : Susceptible of domestication.

15. RAPTORES. (Owls, hawks, eagles, vultures, buzzards.)

Useful products :

Ornamental feathers. D. 23.

Quills. D. 22.

Useful traits :

Susceptible of domestication and use in hunting.¹

¹Nine species of falcons, hawks, and owls have been employed in the chase by Europeans.

15. RAPTORES—Continued.

Useful traits :

Scavengers, (vultures, buzzards.)

Destroy vermin, (owls, hawks.)

Injurious traits : Destroy domestic animals, eggs, &c.

16. COLUMBÆ. (Pigeons and doves.)

Useful products :

Food.

Ornamental feathers. D. 23.

Useful traits :

Game-birds.

Susceptible of domestication.

Used as targets, (wild pigeon.) B. 25.

Used as carriers, (carrier-pigeon.)

17. GALLINÆ. (Turkey, grouse, partridge, sage-cock, ptarmigan quail, and the domesticated peacock, guinea-fowl, and fowl.)

Useful products :

Foods, flesh. D. 1.

Ornamental feathers. D. 23.

Quills. D. 22.

Albumen. D. 30.

Useful traits :

Game-birds.

Susceptible of domestication.

18. LIMICOLÆ. (Plover, ring-neck, surf-bird, oyster-catcher, turnstone avoset, stilt, phalarope, woodcock, snipe, sandpiper dunlin, godwit, sanderling, willet, tattler, yellow shanks, green-shanks, curlew.)

Useful products :

Food: Flesh. D. 1.

Eggs. D. 1.

Feathers. D. 23.

Useful traits: Game-birds.

19. HERODIONES. (Ibises, spoonbills, herons, egrets, bitterns.)

Useful products: Ornamental feathers. D. 23.

Useful traits: Destroy vermin.

20. ALECTORIDES. (Cranes, rails, crakes, gallinules, coots.)

Useful products :

Food, (rails, crakes.) D. 1.

Feathers. D. 23.

Useful traits : Susceptible of domestication, (cranes.)

21. LAMELLIROSTRES. (Flamingoes, swans, geese, ducks.)

Useful products :

Food : Flesh, (geese, ducks.) D. 1.

Eggs, (geese, ducks.)

Ornamental feathers, (flamingo, geese, &c.) D. 23.

Down, (geese, ducks.) D. 23.

Useful traits :

Susceptible of domestication, (geese, ducks.)

Used as decoys for other swimmers, (brants, ducks.)

22. STEGANOPODES. (Gannets, pelicans, cormorants, darters or water-turkeys, frigate birds, tropic birds.)

Useful products :

Ornamental feathers, (darters, tropic birds.) D. 23.

Leather, (of feet.) D. 20.

Useful traits : Susceptible of domestication.¹

23. LONGIPENNES. (Gulls, terns, skimmers, petrels, albatrosses shearwaters.)

Useful products :

Food, eggs. D. 1.

Ornamental feathers, (gulls, terns, &c.) D. 23.

Oil, (petrels, &c., used by Eskimos.) D. 27.

24. PYGOPODES. (Loons, grebes, auks, puffins, guillemot, murre.)

Useful products :

Foods, (eggs.) D. 1.

Ornamental feathers, (grebes.) D. 23.

Feathers used as furs, (grebes, auks, &c.) D. 8.

25. SPHENISCI. (Penguins.)

Useful products :

Feathers used as fur. D. 6.

Oil. D. 27.

¹ *Graculus carbo* used in Europe for fishing and a similar species in China.

III. REPTILES.

26. CROCODILIA. (Alligator, crocodile.)

Useful products:

Food. D. 1.

Ivory. D. 8.

Leather. D. 20.

Oil. D. 27.

Musk. D. 28.

Injurious traits:

Enemies of man and domestic animals.

27. TESTUDINATA. (Tortoises, terrapin, leather-back, green, logger-head, and hawks-bill turtles.)

Useful products:

Food: Flesh, (green turtle, terrapin, gopher tortoise.) D. 1.

Eggs, (green turtle, terrapin, gopher tortoise.)

Oil from eggs, (green turtle.) D. 27.

Shell, (turtles.) D. 13.

Perfume. D. 28.

Methods of capture and transportation. E. 3.

28. LACERTILIA. (Lizards, skinks, horned-toads, chameleons, scorpions, joint-snakes, &c.)

Useful products: Food of Indians. D. 1.

Medicinal product: (Skink.) D. 30.

Useful traits: Destroy noxious insects.

29. OPHIDIA. (Snakes.)

Useful products:

Leather, (rattlesnakes, bull snakes.) D. 27.

Medicinal products, (rattlesnakes, copperheads.) D. 30.

Oil, (rattlesnakes.) D. 27.

Useful traits: Destroy vermin.

Injurious traits: Enemies of man, (rattlesnakes, copperheads, and moccasins.)

IV. AMPHIBIANS.

30. ANURA. (Frogs, toads, hyla, &c.)

Useful products:

Food, (frogs.) D. 1.

Material for physiological instruction, (frogs.)

30. ANURA—Continued.

Useful products:

Weather indicators, (hyla.)

Useful traits: Destroy noxious insects, (toads.)

31. URODELA. (Salamanders, axolotls, and menopomes.)

Useful products: Foods, aboriginal, (axolotls.)

Useful traits: Aquarium use.

Injurious traits: Enemies of young fish.

32. PROTEIDA. (River-dogs, hell-benders.)

Injurious traits: Enemies of young fish.

33. TRACHYSTOMATA. (Sirens.)

V. FISHES.

34. PEDICULATI. (Sea-bats or devil-fish, goose-fish or angler, mouse-fish, &c.)

Useful products: Baits, (goose-fish.) D 1.

Injurious traits: Enemies of aquatic birds, (goose-fish.)

35. PLECTOGNATHI. (Sun-fish, rabbit-fish, porecupine-fish, swell-fish, box-fish, trunk-fish, cow-fish, file-fish, trigger-fish.)

Useful products:

Food, (file-fish, trunk-fish.) D. 11.

Clothing, (helmets made from porecupine-fish.) D. 20.

Oils, used in medicine, (sun-fish.) D. 27.

Shagreen, (file-fish, trigger-fish.) D. 30.

36. LOPHOBRANCHII. (Sea-horse, pipe-fish.)

Useful traits: Aquarium use.

37. HEMIBRANCHII. (Snipe-fish, trumpet-fish, stickleback.)

Useful traits: Aquarium use, (sticklebacks.)

Injurious traits: Destroy eggs of other fishes.

38. TELEOCEPHALI:

HETEROSOMATA, (soles, flounders, flatfish, turbot, halibut.)

Useful products:

Foods: Fresh. D. 1.

Smoked, (halibut.) D. 2.

Pickled, (halibut.) D. 3.

Baits, D. 5.

38. TELEOCEPHALI—Continued.

ANACANTHINI, (cod, pollock, haddock, hake, ling, eusk, burbot, rockling, lance.)

Useful products:

Food: Fresh. D. 1.

Salted, wet, (cod,) (cods' sounds, tongues.) D. 3.

Salted, dry, (cod, haddock, hake.) D. 2.

Bait, (lance.) D. 5.

Isinglass, (cod, haddock, hake.) D. 24.

Leather, (N. W. coast Indians, cod.) D. 27.

Oil, (cod, haddock, hake, livers.) D. 30.

ACANTHOPTERI, (Wolf-fish, blenny, oyster-fish, toad-fish, lump-fish, sea-snail, goby, sea-robin, gurnard, sculpin, sea-raven, Norway haddock or hemdurgan, red-fish, rock cod (west coast), black-fish, or tautog, cunner or chogset, parrot-fish, vurparous-fish (west coast), surgeon-fish, angel-fish, chaetodons, sword-fish, bayonet-fish, scabbard-fish, mackerel, cero, tunny, bonito, crevallé, pompano, pilot-fish, dolphin, butter-fish, weak-fish, drum, croaker, king-fish, whiting, bass, sheepshead, scup or porgy, grunts or pig-fish, black bass, sunfish, strawberry bass, rock bass, perch, groupers, striped bass or rock-fish, blue-fish, tailor, cobia, remora, barracuda.)

Useful products:

Food: Fresh. D. 1.

Salted, wet, (sword-fish, mackerel, tunnies, pompanoes, blue-fish.) D. 2.

Baits. D. 5.

Isinglass, (weak-fish, drum, &c.) D. 24.

Ornament, scales, (parrot-fish, drum.) D. 14.

Injurious traits:

Poisonous, (barracuda, dolphin, &c.)

Enemies of vessels, (sword-fish, bayonet-fish.)

Parasitic on useful fishes, (remora, toad-fish, and sea-snail, (on oysters and pectens,) &c.)

Bait-thieves, (sculpins.)

38. TELECOPHALI—Continued.

PERCESOCES. (Atherines, mullet.)

Useful products:

Food: Fresh. D. 1.

Salted, smoked, (mullet, mullet-spawn.) D. 2.

Salted, wet, (mullet.) D. 3.

Bait, (atherines.) D. 5.

Scales, (mullet.) D. 14.

SYNENTOGNATHI. (Gar-fish, flying-fish.)

Useful products:

Food: Fresh. D. 1.

Salted, smoked, (gar-fish, flying-fish.) 1.

HAPLOMI. (Blind-fish, pike, pickerel, minnows.)

Useful products:

Food, (pike, pickerel.) D. 1.

Bait, (minnows.) D. 5.

Injurious traits:

Enemies of other fishes and of aquatic birds, (pikes, pickerels.)

ISOSPONDYLI. (Capelin, oulachan, smelt, white-fish, salmon, trout, tarpum, herring, menhaden, shad, alewife or gaspereau, anchovy, &c.)

Useful products:

Food: Fresh. D. 1.

Salted, (shad, salmon, white-fish, herring, &c.) D. 2.

Smoked, (herring, salmon, &c.) D. 1.

Canned, (salmon, menhaden, sardines, &c.) D. 1.

Eggs. D. 1.

Sauce, (anchovy.) D. 3.

Oil, (salmon, oulachan, white-fish, menhaden, herring.) D. 27.

Bait, (capelin.) D. 5.

Ornamental scales, (tarpum.) D. 14.

Gnano, (menhaden, herring, &c.) D. 31.

Modes of culture. E. 9.

EVENTOGNATHI. (Suckers, dace, buffalo-fish, carp, tench, &c.)

Useful products:

Food. D. 1.

Bait. D. 5.

Artificial pearls. D. 29.

Modes of culture, (including domesticated species.) E. 9.

39. NEMATOGNATHI. (Cat-fish, "bull-heads," &c.)

Useful products:

Food. D. 1.

Guano, (cat-fish.) D. 31.

40. APODES. (Eels, congers.)

Useful products:

Food. D. 1.

Bait, eel-skins. D. 5.

Leather, (eels.) D. 20.

41. CYCLOGANOIDEI. (Mud-fish, or amia.)

42. RHOMBOGANOIDEI. (Gar-pikes.)

Useful products: Scales, used for arrow-tips. D. 14.

Injurious traits: Enemies of other fish.

43. SELACHOSTOMI. (Paddle-fish, or spoon-bill)

44. CHONDROSTEI. (Sturgeons.)

Useful products:

Foods: Fresh. D. 1.

Smoked. D. 1.

Eggs, pickled, (caviare.) D. 3.

Chorda-dorsalis, dried, (veziga.) D. 2.

Isinglass, (sturgeon.) D. 24.

Oil. D. 27, T.

Scales. D. 14.

Useful traits: Scavengers.

Injurious traits: Said to destroy eggs of white-fish.

VI. ELASMOBRANCHIATES.

45. HOLOCEPHALI. (Chimæra, or king of the herrings.)

46. RAIÆ. (Skates, rays, "devil-fish.")

47. SQUALI. (Sharks.)

Useful products:

Food, (sharks, skates.) D. 1.

Bone, (sharks.) D. 9.

Oil, livers, (sharks, rays, &c.) D. 27.

Shagreen, (sharks.) D. 20.

Injurious traits: Enemies of man and fishes.

VII. MARSIPOBRANCHIATES.

48. HYPEROARTIA. (Lamprey-eels, or nine eyes.)

49. HYPEROTRETI. (Suckers, or hags.)

Useful products: Food, (lamprey-eels.) D. 1.

Useful traits: Scavengers, (hags.)

VIII. LEPTOCARDIANS.

50. CIRROSTOMI. (Amphioxus.)

Modes of capture. D. 6.

IX. INSECTS.

51. HEXAPODA. (Bees, butterflies and moths, flies, beetles, bugs and lice, grasshoppers and crickets, dragon-flies and caddice flies.)

Useful products :

Food of aborigines.

Honey, (bees, &c.) D. 1.

Wax, (bees, &c.) D. 30.

Baits, (flies, bees, dragon-flies, beetles and their larvæ, grasshoppers, &c.) D. 5, B. 45.

Silk, (moths.) D. 8.

Coloring material, (cochineal insect, &c.) D. 29.

Blistering preparations, (Spanish-flies, &c.) D. 30.

Wings used in the arts, (beetles.) D. 19.

Useful traits :

Puncture trees, producing galls, manna, lac, &c.

Injurious traits :

Injurious to vegetation, (numerous species.)

Internal and external parasites, (flies.)

52. MYRIAPODA. (Centipedes, millipedes.)

Useful products: Food of aborigines, (eggs.) D. 1.

Injurious traits: Venomous, (centipedes, millipedes.)

X. ARACHNEANS.

53. ARACHNIDA. (Spiders, scorpions, mites, &c.)

Useful products:

Fine threads used by opticians, (spiders.)

Silk, (spiders.)

53. ARACHNIDA—Continued.

Useful traits: Destroy noxious insects, (spiders.)

Injurious traits:

Venomous, (scorpions.)

Parasites, (mites.)

XI. ARTHROPODS.

54. CRUSTACEA. (Crabs, lobsters, shrimps, prawns, crawfish, limnoria, fish-lice, lernæans, sand and water fleas, barnacles, horseshoe crabs, &c.)

Useful products:

Foods, (fresh and canned crabs, lobsters, shrimps, prawns, crawfish, lobsters.)

Baits, (crabs, lobsters, shrimps, prawns, &c.)

Manures, (horseshoe crabs.)

Useful traits: Skeleton cleaners, (beach fleas, &c.)

Injurious traits:

Parasites on fishes and marine mammals, (barnacles, fish-lice, &c.)

Destroy earthworks, dams, &c., (crawfish.)

Destroy submerged timbers, (limnoria, &c.)

Modes of protection against injurious species. E. 4.

Methods of capture. D. 7, 31, 32.

XII. WORMS.

55. ANNELIDA. (Sipunculoids, leeches, earth-worms, serpulæ, sea-worms, &c.)

Useful products:

Food of aborigines, (earth-worms.) D. 1, 2.

Baits, (earth-worms, sea-worms.) D. 5.

Useful traits:

Used in surgery, (leeches.)

Used as barometers, (leeches.)

Injurious traits: External parasites of animals, (leeches.)

Methods of culture, (leeches.) E. 11.

56. COLECIDA. (Tape-worms and flukes, planarians, nemerteans, trichinæ, thread-worms, rotifers, &c.)

Injurious traits: Internal parasites, (numerous species.)

XIII. MOLLUSKS.

57. CEPHALOPODA. (Octopus, nautilus, argonauts, calamaries or squids.)

Useful products:

Food, (squids and their eggs.) D. 1.

Bait, fresh and salted, (octopus, squids.) D. 1, 5.

Ink, sepia, (sepias.) D. 29.

"Bone," used as food for animals. D. 5.

"Bone," used in arts and manufactures. D. 19.

58. GASTROPODA. (Land-snails, sea-snails, whelks, limpets, &c.)

Useful products:

Food, (numerous species.) D. 1, 2.

Bait, (limpets, &c.) D. 5.

Nacre, (top-shells, ear-shells, &c.) D. 15.

Shell used in arts and manufactures. D. 16.

Useful traits:

Carion-feeders, (strombus and other siphonated genera.)

Food of useful animals.

Injurious traits:

Predatory on other mollusks, (murex, buccinum, natica, &c.)

Injurious to vegetation.

59. CONCHIFERA. (Ordinary bivalve shells.¹)

Useful products:

Food, fresh, dried, and pickled, (numerous species.) D. 1, 2, 3.

Baits, (clams, mussels, &c.) D. 5.

Pearls and nacre, (river-mussels, pearl-oysters, &c.) D. 15.

Shell used in arts and manufactures. D. 16.

Injurious traits: Borers in wood and stone, (ship-worms, pholas, gastrochaena, date, shells, saxicava, unguolina, &c.)

XIV. RADIATES.

60. ECHINODERMATA. (Sea-cucumber, sea-urchins, star-fishes, ophiurans.)

Useful products:

Food, fresh, (sea-urchins and their eggs.) D. 1.

Food, dried, (bêches le mer.)

¹ *Tunicata*, *brachiopoda*, and *bryzoa* are omitted, on account of their very remote usefulness.

60. ECHINODERMATA—Continued.

Injurious traits:

Burrowers, (various echinoids.)

Destroyers of useful mollusks.

61. CŒLEENTERATA. (Acalephs, polyps, &c.)

Useful products: Coral, various species of polyps.) D. 17.

Injurious traits: Clog seines, weirs, and fishing-lines, (acalephs.)

XV. PROTOZOANS.

62. RHIZOPODA. (Sponges and foraminifera.)

Useful products:

Food, "mountain meal," (foraminifera.) D. 1

Infusorial earths, (foraminifera.) D. 18.

Sponges, used in arts and manufactures. D. 26.

SECTION B.

(THE CHASE AND THE FISHERIES.)

MEANS OF PURSUIT AND CAPTURE.

I. HAND IMPLEMENTS OR TOOLS.

** For striking.*

1. CLUBS:

a. Unarmed clubs:

Salmon-clubs, used by the Indians of the Northwest coast.

Other fishing-clubs.

Hunting-clubs.

b. Armed clubs:

Stone-headed clubs.

Clubs, armed with teeth or bone points.

Clubs, armed with metal points.

2. SLUNG-WEIGHTS:

a. Slung-stones.

b. Slung-shot.

c. ("Morning stars.")

d. ("Flails.")

*** For cutting.*

3. KNIVES:

a. Straight knives:

Hunting-dirks and daggers.

Hunting-knives, scalp-knives, &c.

Blubber-knives, aboriginal and recent.

Boarding-knives used by whalers.

Whaleman's boat-knives.

Bowie-knives.

Flaying-knives, aboriginal and recent.

Splitting-knives.

Heading-knives.

Sailors' and fishermen's sheath-knives.

Hunters' sheath-knives.

Slivering-knives, used by fishermen.

Oyster-knives.

3. KNIVES—Continued.

a. Straight knives:

Mackerel rimmers or fattening knives.

(Swords, including the various forms incidentally used in hunting, sabers, cutlasses, machétes, creases, &c.)

Stone and bone knives, used by Indians and Eskimos.

Skin scrapers and parers, used in preparing leather.

b. Clasp-knives:

Sailors' clasp-knives.

Hunters' clasp-knives.

Clasp-dirks.

Jockey knives.

4. AXES:

a. Axes, proper:

Tomahawks.

Hatchets.

Whaleman's boat-hatchets.

Cleavers.

Axes, used by fishermen and hunters.

Head-axes for whalemen.

b. Cutting-spades:

Whale-spades:

Cutting-spades.

Throat-spades, flat and round shank.

Wide spades.

Half-round spades.

Head-spades.

Blubber-mincing knives.

Chopping-knives.

*** *For thrusting.*

5. THRUSTING SPEARS AND PRODS:

a. Fishing-lances.

Whale-lances.

Whaleman's boat-spades, thick and thin.

Seal-lances.

Fish-lances.

b. Hunting-spears.*c.* Bayonets.*d.* Prodding-awls, used in piercing the base of the brain in killing fish for the table.

II. IMPLEMENTS FOR SEIZURE OF OBJECT.

* *Scooping-instruments.*

6. SCOOPS.

† *For hand-use.*

a. Shovels:

Clam-shovels.

Trowels used in taking burrowing shore animals.

Hand-scoops.

b. Hand-dredges, used in collecting mollusks.

c. Pile-scrapers.

†† *For use with sounding-lines.*

d. Armed leads:

Common "deep-sea lead."

Deep-sea-sounding apparatus.

e. Cup-leads.

f. Scoop sounding-machines.

** *Grasping-hooks.*

7. HOOKED INSTRUMENTS. (Those used with a single motion, that of hooking:)

a. Single-pointed hooks:

Gaff-hooks.

Boat-hooks.

Jigs.

Rabbit and squirrel hooks, used by the Ute Indians.

Snake-hooks.

Clam-hooks.

Hoes and picks used in gathering shell-fish.

Forks used in handling salted and dried fish.

Whalemen's hooks:

Blubber-hooks.

Blubber-forks.

Junk-hooks.

Lance-hooks.

Can-hooks.

7. HOOKED INSTRUMENTS—Continued.

b. Many-pointed hooks :

Grappling-irons.

Lip hooks or grapnels, used by whalers.

Toggles, used by whalers.

Oyster-rakes.

Clam-rakes.

Oulachan rakes or spears.

Squid-jigs.

c. Twisting-rods, used in drawing small mammals from their burrows.

8. BARBED IMPLEMENTS. (Those used with two motions, the first that of thrusting :)

a. Spears with fixed heads:

Harpoons.

One-flued harpoons.

Two-flued harpoons.

Toggle-harpoons.

Harpoon-bullets. (See under 23.)

Gun-harpoons.

Other whaleman's "craft."

Barbed spears, (with single point.)

Grains, (with two prongs.)

Gigs.

Bird-spears.

Otter-spears.

Sea-otter spears.

Seal-spears.

Walrus-spears.

Eel-spears.

Flounder-spears.

Sturgeon-spears, (west coast.)

Octopus-spears.

Crab-spears, used in Rhode Island.

b. Spears with detachable heads:

Lily-irons.

Dolphin-irons.

Indian harpoons of shell and iron.

Eskimo harpoons of stone, bone, and iron.

8. BARBED INSTRUMENTS—Continued.

b. Spears with detachable heads:

Indian fish-harpoons.

Other fish-harpoons.

(For accessory apparatus, see under 29.)

9. TONGS, &c.

† *For hand use.*

a. Tongs (with two handles:)

Oyster-tongs.

Oyster-rakes.

b. "Nippers," (with cord and handle.)

Snake-tongs.

Sponge-tongs.

Coral-tongs.

†† *For use with sounding-lines.*

c. "Clamms" for deep-sea soundings, (forceps closed by a weight.)

(Ross's "Deep-sea clamms.")

(Bull-dog sounding-machine.)

*** *Grasping-lines.*

10. NOOSES.

† *Stationary nooses.*

a. Jerk-snares:

Bird-snares.

Fish snares, of wire, gut, hair, &c.

†† *Thrown nooses.*

b. Lariats and lassos:

Lariats with rope noose, made from hair, hemp, and rawhide.

Lariats with metal noose.

(Chilian bird-lariat.)

11. LOADED LINES. (Bolas.)

a. Bird-slings, used by Eskimos.

b. Bolas, with one or several weights.)

**** *Entangling lines.*

12. TANGLES.

a. Tangles:

Swab-tangles.

(Dredge-tangles, used by English collectors.)

Harrow-tangles.

Wheel-tangles.

III. MISSILES.

* *Simple missiles, (those propelled by the unaided arm.)*

13. HURLED WEIGHTS.

- a. Stones and discs thrown by the hand.
- b. Weights dropped from an elevation, (dead-falls, not automatic.)

14. HURLED STICKS.

- a. Straight sticks :
Clubs used as missiles.
- b. Curved sticks :
Throw-sticks, used by the Moqui Indians of New Mexico in hunting rabbits.
(Boomerangs.)

15. HURLED SPEARS.

- a. Darts and lances.

** *Centrifugal missiles. (Propelling power augmented by an artificial increase of the length of the arm.)*

16. SLINGS AND SPEARS THROWN BY STRAPS.

- a. Slings.
- b. Spears, with straps used in throwing them.

17. MISSILES PROPELLED BY "THROWING-STICKS."

- a. Spears with throwing-sticks, used by Eskimos :
Series of throwing or darting sticks.

*** *Missiles propelled by a spring.—† Spring consisting of bent rod.*

18. BOWS AND ARROWS.

- a. Bows :
Simple bows.
(Cross-bows.)
(Ballistas.)
- b. Arrows :
Lance-arrows.
Harpoon-arrows, used in fishing.
Blunt or club arrows, used in killing birds.
- c. Accessories of bows and arrows :
Holders.
Quivers.
Arrow-head pouches.

18. BOWS AND ARROWS—Continued.

d. Implements of manufacture :

Flint-chipping apparatus.

Arrow-head sharpeners.

Shaft-gauges.

Cord-twisting apparatus.

Shaft-polishers.

Glue-sticks, used in fastening head of arrow.

‡‡ *Spring consisting of elastic cord.*

19. INDIA-RUBBER SLINGS.

a. Pea-shooters, used in killing birds.

‡‡‡ *Spring consisting of metallic helix.*

20. SPRING-GUNS.

a. Spring-guns.

**** *Missiles propelled by the compression of air or water.*

21. AIR-GUNS.

a. Blow-guns, (missile propelled by the breath :)

Blow-guns carrying arrows.

Blow-guns carrying balls.

b. Piston air-guns.

c. Reservoir air-guns :

Air-guns.

Air-gun canes.

22. WATER-GUNS.

a. Syringe-guns :

Humming-bird guns.

***** *Fire-arms.*

23. GUNS AND PISTOLS.

a. Muzzle-loading arms :

With smooth bores :

Muskets.

Fowling-pieces.

Cane-guns.

Pistols :

Single-barreled pistols.

Revolvers.

With grooved bores : Rifles.

Rifle-muskets.

Rifle-carbines.

Pistols.

23. GUNS AND PISTOLS—Continued.

b. Breech-loading arms :

With smooth bores :

Fowling-pieces.

Pistols.

With rifled bores :

Muskets.

Hunting rifles.

Carbines :

Single-barreled carbines.

Revolving carbines.

Pistols :

Pistols.

Revolvers.

c. Whaling-guns :

Bomb lance and gun.

Harpoon ball and gun.

Harpoon-gun.

Harpoon bomb-lance gun.

24. (ACCESSORY.) AMMUNITION AND ITS PREPARATION.

a. Explosives :

Gunpowder.

Gun-cotton.

Percussion powder :

Caps.

Needle percussion.

Primers.

Wood powder.

Dynamite or giant-powder.

Nitroglycerine.

Dualine.

Lithofracteur.

Colonia powder.

Other explosives.

b. Missiles :

Bullets.

(Accessory) bullet-molds.

Shot.

(Accessory) methods of manufacturing shot.

24. (ACCESSORY.) AMMUNITION, &c.—Continued.**b. Missiles :**

Explosive bullets, shells, &c. :

Bomb-lance.

Meigs's shells.

c. Wadding :

Bulk wadding.

Prepared wads.

(Accessory) wad-cutters.

d. Ammunition-measures :

Measures.

Shot-measures.

Powder-measures. } Attached to pouches and separate.

Weighing-scales.

e. Prepared ammunition :

Cartridges :

Ball-cartridges.

Shot-cartridges.

Wire-cartridges.

(Accessory) paper-shells.

(Accessory) metallic shells.

f. Methods of preparing cartridges :

Loaders.

Crimpers.

Cappers.

25. ACCESSORIES OF LOADING, CLEANING AND REPAIRING, SIGHTING, AND TESTING FIRE-ARMS.**a. Instruments for cleaning, loading, &c. :**

Rammers.

Swabs.

Charge-drawers, "worms."

b. Sights, &c. :

Muzzle-sights :

Plain sights.

Slit-sights.

Globe-sights.

Peep-sights.

Breech-sights :

Plain sights.

Graduating sights.

25. ACCESSORIES OF LOADING, &c.—Continued.

b. Sights, &c.:

Telescope-sights.

Levels, attached to guns

Wind-gauges.

c. Targets:

Practice-targets.

“Gyro-trap” targets.

Pigeon-traps and accessories of pigeon-shooting.

d. Recoil-checks.

26. FOR CARRYING ARMS AND AMMUNITION.

a. Ammunition-holders:

Powder-holders:

Horns.

Flasks.

Canisters.

Shot-holders:

Pouches.

Belts.

Cartridge-holders:

Pouches.

Boxes.

Belts.

Vests.

Cap-holders:

Pouches.

Boxes.

Cap-straps, used by Indians.

b. Weapon-holders:

Slings for arms:

Shoulder-slings.

Saddle-slings.

Holsters.

Belts:

Pistol-belts.

Racks and cases:

Gun-racks.

Gun-cases.

IV. BAITED HOOKS. ANGLING-TACKLE.

27. HOOKS WITH MOVABLE LINES.

a. Tackle for surface-fishing :

Fly-fishing tackle.

Salmon-tackle.

Trout-tackle.

Black-bass tackle.

Shad-tackle.

Trolling-tackle :

Trolling-tackle.

Whiffing-tackle.

Drailing-tackle.

Gangs of hooks for minnow-bait.

Surf-tackle for throwing and hauling :

Striped-bass tackle.

Redfish or bass tackle.

Bluefish tackle.

Tide-drailing tackle :

Pasque and cuttyhunk bass-tackle.

b. Tackle for fishing below the surface :

Short hand-gear :

Mackerel-gear.

Deep-sea gear :

Cod-gear.

Halibut-gear.

Flounder-gear.

Shark-gear.

Tautog-gear.

Other bottom-gear.

Bobs :

Eel-bobs.

28. HOOKS, WITH STATIONARY LINES.—SET TACKLE.

a. Surface lines :

Spilliards, or floating-trawl lines.

b. Bottom-set lines :

Trawl-lines, or bull-tows.

29. (ACCESSORY.) PARTS AND ACCESSORIES OF ANGLING-APPARATUS AND OF HARPOON AND SEINE LINES.

a. Hooks, including a full series of unmounted hooks, of recent and aboriginal manufacture.

Plain hooks :

Fly-hooks.

Trout-hooks.

Salmon-hooks.

Cod and halibut hooks.

Hooks for general use.

Bass-hooks.

Jigs and drails :

Mackerel-jigs.

Blue-fish drails of bone and metal of the various patterns, Newport, Noank, Providence, Provincetown, &c.

Block Island drails.

Pearl-squids of various patterns.

Bone-squids.

Metal-squids.

Petticoat-squids of flannel, &c.

Spoon-baits, plain and fluted :

Bass-spoons.

Pickrel-spoons.

Trout-spoons.

Blue-fish spoons.

Other trolling-spoons.

Artificial flies on hooks :

Salmon-flies for each month.

Trout-flies for each month.

(Accessory.) Fly-books.

b. Lines, (twisted and plaited :)

Silk-lines.

Grass-lines.

Linen-lines.

Cotton-lines.

Cotton-hemp lines.

Bark-lines.

Manila-lines.

Hide-lines.

29. (ACCESSORY.) ANGLING-APPARATUS, &c.—Continued.

b. Lines, (twisted and plated:)

Gut-lines.

Lines made from sea-weed, (*Nereocystis Lütkeana*,) and used by natives of Alaska.

(Lines of sea-weed, (*Chorda filum*,) used similarly in Scotland.)

(Accessory.) Apparatus for twisting lines.

c. Snoods, leaders, and traces:

“Cat-gut,” (sheep,) snoods, and leaders.

Silk-worm-gut snoods.

Salmon-gut snoods.

Flax-snoods.

Gimp-snoods.

Wire-snoods.

“Sid-straps.”

d. Whalers' chains and lines:

Head chains and ropes.

Fin-chains.

Fluke chains and rings and ropes.

Head pike and ring.

(Accessory.) Blocks, pendants, cutting-blocks, &c.

e. Sinkers:

Boat-shaped sinkers, plain and shearing.

Pipe-lead sinkers.

Bullet-sinkers.

Plummet-sinkers, sugar-loaf, pear-shaped, and double-taper.

Banker-sinkers.

Seine-sinkers, of chain, lead balls, lead rings, stone, &c.

(Accessory.) Molds for sinkers.

Jig-molds.

Other sinker-molds.

f. Spreaders:

Chopsticks.

One-armed chopsticks, or “revolving booms.”

g. Floats:

Line-floats of wood, cork, and quill.

Harpoon-floats of bladder, inflated skir, and wood.

Seine-floats of cork, wood, glass, and rubber-tubing.

Keg and other floats for lobster-pots, gill-nets, &c.

Whale-line drag.

29. (ACCESSORY.) ANGLING-APPARATUS, &c.—Continued.

h. Reels:

Simple reels for fly-fishing, with and without check.
Multiplying reels for bass-fishing, with and without check.
Other multiplying reels.
Gunwale-winches.
Dredge-line rollers.
Trawl-line rollers.
Seine-windlasses.

i. Line-holders:

Winders.
Spools.
Whaleman's line-tub.
Tubs for trawl-lines.
Seine-reels.

k. Rods:

Straight rods, of cane, wood, whalebone, &c.:
Salmon-rods.
Trout-rods.
Bass-rods.
Pickerel-rods.
Other rods.
Folding-rods.
Tips of rubber, whalebone, &c.
Tell-tales, used in trolling.
Tell-tales for fishing under the ice.
(Accessory) cases for rods and rod-tops.

l. Swivels:

Box-swivels.
Hook-swivels.
Pot-gauge swivel.
Cod-line swivels.
Trawl buoy-rope swivels.

m. Clearing-rings.*n.* Disgorgers.

V. NETS.

30. ENTANGLING-NETS.

a. Meshing-nets, (entangling in meshes :)

‡ BARRIER-NETS.

Rabbit-nets, used by Indians of the Southwest.

Bird mesh-nets.

Gill-nets, used in great lakes.

‡ DRIFT-NETS.

† *Those drifting across the tide.*

Shad gill-nets, used in southern rivers.

Bass gill-nets.

Salmon gill-nets.

Mullet gill-nets.

‡ *Those drifting along the tide.*

Mackerel gill-nets.

Herring gill-nets.

b. Pocket-nets, (entangling in pockets :)

Trammel-nets.

31. ENCIRCLING-NETS.

a. Seines :

Seal-seines.

Manatee-seines.

Shad-seines.

Mullet-seines.

Menhaden-seines.

Bass-seines.

Blue-fish seines.

Capelin-seines.

Herring-seines

Cod-seines.

Lance-bunts.

Baird collecting-seines.

Bait-seines.

"Fly-tail" seines of North Carolina.

b. Hoop-nets :

Handle, or dip-nets :

Bull-nets, (worked with ropes and blocks.)

31. ENCIRCLING-NETS—Continued.

b. Hoop-nets :

Handle or dip-nets :

Scoop-nets, (herring-nets, pound-scoops, ear-scoops, &c.)

Landing-nets.

Eskimo ank-nets.

Baited hoop-nets :

Crab-nets.

c. Trailing-nets :

Trawls :

Beam-trawl.

(Otter-trawl.)

Dredges :

Flange, or ordinary dredge.

Rake-dredge.

Oyster-scraper.

(Coral-dredge.)

Towing-nets :

Surface tow-nets.

d. Folding or jerk nets :

Purse-nets :

Mackerel purse-seines, (pursed by weight.)

Menhaden purse-seines, (pursed by hand-ropes.)

Cast-nets :

Mullet cast-nets.

Pompano cast-nets.

Bait cast-nets.

Clap-nets for birds.

Rabbit-spring nets.

Spring-weirs, (St. Lawrence.)

Sieve-traps, (for birds.)

e. (Accessory.) Parts of nets and apparatus for manufacture :

Raw material of nets.

Babiche. (See under D. 20.)

Netting-fibre.

Netting-twine.

Netting-needles.

Mesh-needles.

Hanging-needles.

Eskimo netting-needles.

VI. TRAPS.

32. PEN-TRAPS.

a. Pocket-traps:

Pitfalls:

Pits, covered.

Barrel-traps.

Jar mole-traps.

"Rabbit-tipe," used in England.

Salmon-baskets, (Columbia River.)

Salmon-weirs, (Upper Columbia River.)

River-weirs, with pockets:

Eel-traps.

Fish-slides:

Shad-slides, used in the rivers of North Carolina.

b. Labyrinth-traps:

Corrals.

Turkey-traps.

Weirs, or pounds:

Heart-pound.

Salmon-weir.

Virginia Indian weir, (figured by DeBry.)

Salmon hook-gill-net of the Saint Lawrence.

Funnel-traps:

Fish-pots.

Lobster-pots.

Eel-weirs, (with leaders.)

Eel-pots, (without leaders.)

Barrel-pots, for eels.

West India wicker fish-pots.

Set-nets.

Fykes, (set-nets with leaders.)

Bass-traps.

c. Door-traps:

† *Closed by the falling of a door.*

Box-traps.

Rabbit-traps, (figure 4.)

Brick traps, (figure 4.)

32. PEN-TRAPS—Continued.

c. Door-traps :

Box-traps :

Musquash traps, with hanging doors.

Rabbit-traps, for mouth of burrows.

Self-setting box-traps.

Double box-traps.

Spring-door traps.

†† Closed by falling of whole trap.

Bowl-traps.

Cob-house bird-traps.

Pigeon-nets.

††† Closed by falling of tide.

Bar-weirs.

d. Sheaf-traps :

Sheaf-traps, (New York Harbor.)

33. CLUTCHING-TRAPS.

a. Noose-traps :

Snares :

Footpath-snares.

Barrier-snares.

Springes.

"Round mouse-traps."

b. Jawed traps :

"Steel traps:"

Newhouse traps :

No. 0. Rat-trap.

No. 1. Muskrat trap.

No. 1½. Mink-trap.

No. 2. Fox-trap.

No. 3. Otter-trap.

No. 4. Beaver-trap.

No. 4½. Deer-trap.

No. 5. Small bear-trap.

No. 6. Great bear-trap.

Spring bird-nets.

(French bird-trap.)

34. FALL-TRAPS.

- a.* Crushing-traps :
Deadfalls.
Figure-four traps.
- b.* Piercing-traps :
Spear-falls.
Mole-traps.
Harpoon-traps.
- c.* Spring-hooks :
Pickerel-hooks.

35. MISSILE-TRAPS.

- a.* Cross-bow traps.
- b.* Spring-guns.

36. ADHESIVE PREPARATIONS.

- a.* Bird-lime, &c.
- b.* Hoods, boots, &c.

VII. APPARATUS FOR WHOLESALE DESTRUCTION.

37. POISONS.

- a.* Food poisons :
Phosphorus poisons.
Strychnine.
Arsenic.
Corrosive sublimate.
Cyanide of potassium.
Opium poisons.
- b.* Blood poison : Woorara

38. ASPHYXIATORS.

- a.* Apparatus for smoking-out.
- b.* (Apparatus for suffocating with fumes of sulphur.)
- c.* Apparatus for drowning-out.

39. TORPEDOES.

39½. STOMACH-SPRINGS.

- a.* Eskimo whalebone springs, used in killing bears.

VIII. HUNTING-ANIMALS.

40. HUNTING-MAMMALS.

- a.* Dogs.
- b.* Hunting-leopard. (*Cynailurus jubatus*.)

40. HUNTING-MAMMALS—Continued.

- c. Weasels and ferrets.
- d. Otters.

41. ACCESSORIES TO HUNTING-DOGS.

- a. Dog-whips.
- b. Dog-whistles.
- c. Dog-collars.
- d. Dog-food.
- e. Dog-carts.
- f. Dog-muzzles.

42. HUNTING-BIRDS.

- a. Falcons.
- b. Owls.
- c. Cormorants, (*Carbo sinensis*, used in fishing in China.)

43. ACCESSORY TO HUNTING-BIRDS.

- a. Hoods.
- b. Perches.
- c. Cormorant-collars.

44. HUNTING-FISHES.

- a. Remora, used in West Indies and Australia.

IX. DECOYS AND DISGUISES.

45. BAITS.

a. Natural baits:

Flies and other insects. (This should include a collection of those insects which, as the favorite food of fishes, are imitated in making artificial flies.)

Worms.

Mollusks.

Salted baits, (prepared.)

Menhaden.

Herring.

Squids.

Clams, long.

Clams, hen.

Pea-roe of cod, (used in French sardine-fisheries, and largely exported.)

Grasshopper paste, used as a substitute for pea-roe.

Tolling baits, "stosh," &c.

45. BAITs—Continued.

a. Natural baits:

(Accessory) methods of preparing baits:

Bait-cutters.

Bait-mills.

Bait-ladles.

Wheelbarrows for bait-clams, (Nantucket.)

Bait boxes and cans.

Bait-needles.

b. Artificial baits:

Trolling-spoons.

Spinners.

Squids and jigs.

"Bobs," used in southern waters.

Artificial flies.

c. Accessory to *b*:

a. Fly-books.

b. Raw materials for making artificial flies.

c. Tools for making artificial flies.

d. Pastes.

46. DECOYS.

a. Scent-decoys.

b. Sound-decoys:

Animal calls, whistles, &c.

Bird-calls.

c. Sight-decoys:

Living decoy animals and birds.

Decoy-dogs, used in hunting ducks.

Stool-pigeons.

Tame decoy-ducks.

Tame decoy-brants.

Imitations of animals and birds:

Decoy swimming-birds.

Decoy-waders.

Imitations of fishes:

Lure-fish used in taking Mackinaw trout.

Blanket-decoys, (for antelopes.)

Lanterns and other apparatus for fire-hunting and fishing,

Lanterns for still-hunting.

46. DECOYS—Continued.

c. Sight-decoys:

Lanterns for weequashing, or fire-fishing, for eels.

Jack-lanterns for fishing.

47. COVERS.

a. Movable covers:

Masks:

Deer heads and antelope heads.

Movable copes.

Covers for hunter.

Covers for boats.

b. Stationary covers:

Hunting-lodges.

X. PURSUIT, ITS METHODS AND APPLIANCES.

48. METHODS OF TRANSPORTATION.

a. Personal aids:

Snow-shoes.

Skates.

Alpenstocks and staves.

Portable bridges.

b. Animal equipments:

Harness:

Horse-trappings.

Dog-harness.

Girths, sinches.

Bits, cabrestos, spurs.

Saddles:

Riding-saddles.

Pack-saddles.

Aparejos.

Riding-pads, (for buffalo-hunting.)

Furpack-saddle, (Hudson's Bay Territory.)

Vehicles:

Deer-sledges.

Dog-sledges.

Wagons.

Dog-carts.

Fish-carts, used in Nantucket.

48. METHODS OF TRANSPORTATION—Continued.

c. Boats:

Hunting-boats, fishing-boats:

Birch canoes.

Canoes used by Indians of the northwest coast in
whaling.

Kyaks or bidarkas.

Umiaks or bidarras.

Indian raft-boats.

Launches.

Dug-outs.

Portable (paper and canvas) boats.

Duck-boats.

Scows.

Oyster-boats.

Whale-boats.

Seine-boats, (sea use.)

Seine-boats of the lakes.

Potomac seine-boats.

Dorys, sharpies, and dingies.

Ponnd-boats of the lakes.

Italian fishing-boats, (California.)

Pinkies, (Martha's Vineyard.)

Adirondack boats.

Alexandria Bay boats.

Surf-boats.

Whitehall boats.

Oyster-canoes.

Ducking-boats.

Cat-rigged fishing-boats.

Mackerel-smacks.

Oyster-smacks.

Menhaden-smacks.

Menhaden-carryaways.

Bank eod-smacks.

Smacks with wells, used near the coast.

Smacks employed in fish-trade.

Whale-ships.

Sealers.

48. METHODS OF TRANSPORTATION—Continued.

c. Boats:

Herring-boats.

Mackinaw boats. }

Huron boats. }

Norwegian boats. }

Pound-boats. }

Used in the Great Lake fisheries.

Oyster-pungies, (canoe and square-sterned,) employed
on the Chesapeake.

Oyster police-boats.

Steamers:

Mackerel-steamers.

Menhaden steam-mills.

Lake gill-net steamer.

Whale-steamers.

Sealing-steamers, &c.

Accessory to fishing-vessels:

Rigging, masts, sails, cordage, pulleys, sockets.

Anchors, killicks, chains.

Sail-needles, palms, fids, marline-spikes.

Oar-locks, chocks, oar-rests.

Stepping-irons for whale-boats.

Crotches and oar-rests.

Paddles and oars.

Rudder-heads, wheels, tillers, &c.

Fog-horns, trumpets, drums, &c.

Cabin, blubber room, cooks' and binnacle lamps and
jacket-lamps, signal, binnacle, and common lanterns.

Compasses, barometers, &c.

Astronomical instruments, sextants, quadrants, chro-
nometers, hour and log glasses.

49. CAMP-OUTFIT.

a. Shelter:

Lodges.

Tents.

Hunting-camps.

Hunters' houses.

Fishing-houses.

49. CAMP-OUTFIT—Continued.

b. Furniture :

Hammocks.

Beds, couches, stretchers, and lounges.

Blankets, rubber and Mackinaw, and fur robes.

Fuel.

Apparatus for kindling fire.

Lamps and lanterns.

Tools.

c. Commissary supplies :

Cooking-apparatus, kettles, and stoves.

Table-furniture.

Preserved meats, &c.

50. PERSONAL EQUIPMENTS.

a. Clothing :

Hunting-suits.

Cloth-suits.

Skin-suits.

Water-proof suits.

Oil-skin suits.

Boots, moccasins, leggings.

Water-proof boots.

Wading boots and stockings.

Riding-boots.

Moccasins.

Leggings.

Hats and caps.

Protection from insects :

Nets for beds and for face.

Ointments, (such as tar and sweet-oil.)

Smudges, (such as pyrethrum powder.)

Shields, breastplates, and defensive armor.

b. Trappings :

Belts.

Cross-belts.

Game-bags.

Game and fish baskets and slings.

Wallets for lines and other tackle.

50. PERSONAL EQUIPMENTS—Continued.

c. Optical instruments, &c.:

Snow-goggles.

Telescopes.

Field-glasses, &c.

Water-telescopes.

d. Medical outfit:

Medicine-chests.

Hunters' and fishermen's flasks.

e. Artificial lights:

Lanterns for camp and ship use.

Torches.

SECTION C.

METHODS OF PREPARATION.

I. PREPARATION AND PRESERVATION OF FOOD

1. PRESERVATION DURING LIFE, (see under E, 3.)

2. PRESERVATION OF FRESH MEATS.

a. Refrigerators :

Ice-boxes and refrigerators.

Refrigerator-cars.

(Accessory.) The ice-trade :

Ice cutting and handling apparatus.

Methods of manufacturing artificial ice.

Ice-houses.

b. Other accessories of preservation :

Meat-hooks.

Skewers, &c.

Carving-tools.

3. PRESERVATION BY DRYING.

a. Sun-drying apparatus :

Beach dryers.

Flake-drying :

Newfoundland flakes.

Massachusetts flakes.

Covers for fish-drying.

b. Smoke-drying apparatus :

Herring smoke-houses.

Halibut smoke-houses.

Salmon smoke-houses.

Sturgeon smoke-houses.

Aboriginal drying-houses.

Methods of drying haliotis, used by the Indians of California.

4. PRESERVATION BY CANNING AND PICKLING.

a. Salting fish :

Knives, (see under B, 2.)

Scaling-apparatus.

Tables, tubs, &c.

Barrels.

(Accessory.) Salt :

Specimens of the salts used in preserving fish.

Model of salt-mills used on Cape Cod in former days.

b. Canning meats :

Model of salmon-canning establishment.

Model of sardine-factory.

(Accessory.) Cotton-oil, and its manufacture.

Model of lobster-canning factory.

Model of oyster-canning factory.

5. PREPARATION OF BAITS.

a. Bait-mills, knives, choppers, &c., (see under B, 2 and 3.)*b.* Bait tubs, vats, &c.II. MANUFACTURE OF TEXTILE FABRICS, FELTS,
AND STUFFINGS.

6. PREPARATION OF WOOL AND HAIR OF MAMMALS.

a. Preparation of wool cloths :

Washing.

Shearing.

Stapling or assorting.

Scouring.

Combing, carding, and plucking.

Spinning and reeling.

Weaving.

Fulling and teasing.

Cropping.

Pressing.

b. Weaving worsted cloths.*c.* Felting and the hat manufacture :

Bowing.

Pressing.

Stopping.

6. PREPARATION OF WOOL, &c.—Continued.

c. Felting and the hat manufacture :

Rolling-off.

Shaping.

d. Preparation of curled hair for stuffings.

7. PREPARATION OF WHALEBONE.

a. Preparation of stuffings.

8. PREPARATION OF FEATHERS.

a. Preparation of down for stuffings.

b. Preparation of feather fabrics.

c. Preparation of "brillantine."

d. Preparation of flocking for wall-paper, from refuse quills.

e. Preparation of fibres for manufacture of plush carpets.

9. PREPARATION OF SILK OF INSECTS.

a. Preparation of silk of silk-worms :

Boiling the cocoons.

Reeling.

Spinning.

Dyeing.

Weaving.

10. PREPARATION OF SOFT PARTS OF OTHER INVERTEBRATES.

a. Preparation of silk from byssus of *Pinna*.

b. Preparation of sponge stuffing.

III. PREPARATION OF THE SKIN AND ITS APPENDAGES.

11. CURRYING OF LEATHER.

a. Processes of currying :

Dipping.

Graining.

Scraping.

Dressing.

b. Implements employed by curriers :

" Head-knives."

" Pommels."

" Stretching-irons."

" Round-knives."

" Cleaners."

11. CURRYING OF LEATHER—Continued.

b. Implements employed by curriers :

“ Maces.”

“ Horses,” or trestles.

“ Dressers.”

“ Treading-hurdles.”

c. Eskimo and Indian currying methods and implements.*d.* Methods of dressing gut and sinew.

12. LEATHER-DRESSING.

a. Processes of tanning leather :

Soaking.

Liming.

Tanning.

b. Processes of tawing or oil-dressing leather :

Soaking.

Liming.

Oiling.

c. Apparatus of leather-dressing, recent and aboriginal.

13. FUR-DRESSING.

a. Processes of fur-dressing :

Currying. (See under 12.)

Scouring.

Tanning.

Lustering.

Plucking and dyeing.

14. FEATHER-DRESSING.

a. Method of preparing ornamental feathers :

Scouring.

Bleaching.

Washing.

Azuring.

Sulphuring.

Scraping.

Dyeing.

b. (Art of plumagery.)

15. MANUFACTURE OF QUILL ARTICLES.

a. Manufacture of quills for pens :

Sand-bath drying and steaming.

Polishing.

15. MANUFACTURE OF QUILL ARTICLES—Continued:.

a. Manufacture of quills for pens:

Dyeing.

Shaping.

b. Manufacture of tooth-picks.*c.* Manufacture of floats and other articles.*d.* Manufacture of quill brush-bristles.

16. HAIR AND WOOL WORK.

IV. PREPARATION OF HARD TISSUES.

17. IVORY CUTTING AND CARVING.

a. Manufacture of handles, trinkets, billiard-balls, &c.:

Turning and sawing.

Polishing.

Bleaching.

b. Manufacture of organ and piano keys:

Sawing.

Strip-sawing.

Polishing.

Bleaching, &c.

c. Other processes.

18. PREPARATION OF HORN AND HOOF.

a. Steaming.*b.* Pressing.

19. PREPARATION OF WHALEBONE.

a. Cutting and other processes.*b.* Manufacture of whip-makers' stock and whips.*c.* Manufacture of umbrella-maker's bone.*d.* Manufacture of ribbon-weaver's bone.*e.* Manufacture of hat and bonnet maker's bone.*f.* Manufacture of suspender-maker's bone.*g.* Manufacture of stock-maker's bone.*h.* Manufacture of dress and stay maker's bone.*i.* Manufacture of billiard-table cushions.*k.* Manufacture of surgical instruments.*l.* Manufacture of whalebone-brushes.*m.* Manufacture of rosettes, woven-work, and trinkets.*n.* Other whalebone manufactures.

20. PREPARATION OF TORTOISE-SHELL.

21. PREPARATION OF FISH-SCALE WORK.
22. PREPARATION OF NACRE.
23. PREPARATION OF CORAL.
24. PREPARATION OF OTHER HARD TISSUES

V. OILS AND GELATINES.

25. EXTRACTION OF WHALE OIL, (WITH MODELS OF TRY-WORKS, CLARIFYING-VATS, &c.)
 - a. Preparation of body-oil:
 - Cutting in and stowing.
 - Leaning and mincing.
 - Trying.
 - Bailing.
 - Cooling.
 - Barreling.
 - Refining.
 - b. Preparation of head-oil.
 - c. Preparation of spermaceti.
 - d. Instruments and appliances of rendering whale oil:
 - Boarding-knives.
 - Leaning-knives.
 - Mincing-horse and mincing-knives.
 - Mincing tub.
 - Mincing-machine.
 - Blubber-fork.
 - Try-pots.
 - Fire-pike.
 - Stirring-pole.
 - Scrap-hopper.
 - Skimmer.
 - Bailer.
 - Cooler.
 - Deck-pot.
 - Casks.
26. EXTRACTION OF OTHER MAMMAL OILS.
27. EXTRACTION OF BIRD AND REPTILE OILS.
28. EXTRACTION OF FISH-OILS, (WITH MODELS OF BOILERS, PRESSES, CLARIFYING-VATS, &c.)
29. EXTRACTION OF GLUE, GELATINE, AND ISINGLASS.

VI. DRUGS, PERFUMES, AND CHEMICAL PRODUCTS.

30. MANUFACTURE OF PERFUMES.
31. MANUFACTURE OF IVORY-BLACK.
32. MANUFACTURE OF PRUSSIATES.
33. MANUFACTURE OF MUREXIDES.
34. PREPARATION OF COCHINEAL COLORS.
35. MANUFACTURE OF INKS FROM ANIMAL SUBSTANCES.
36. PREPARATION OF ALBUMEN.
37. MANUFACTURE OF PEPSIN.
38. MANUFACTURE OF PHOSPHORUS.
39. MANUFACTURE OF SAL AMMONIAC.
40. MANUFACTURE OF AMMONIA.
41. MANUFACTURE OF ALBUMEN PREPARATIONS.
42. MANUFACTURE OF PROPYLAMINE.
43. MANUFACTURE OF FORMIC ACID.
44. MANUFACTURE OF CARBAZOTATES.

VII. MANUFACTURE OF FERTILIZERS.

45. PREPARATION OF GUANO.

a. Model of fish-guano works:

Grinders and pulverizers.

Mixers.

Guano in its various stages, with its ingredients, South Carolina phosphates, Navassa phosphates, scrap, (crude, and dried,) sulphuric acid, kainite, screened and unscreened guano, and sea-weed used in preparation.

VIII. LIMES.

46. BURNING OF LIME.

a. Models of kilns for burning shells.

IX. PRESERVATION OF THE ANIMAL FOR SCIENTIFIC USES.

47. APPARATUS FOR MAKING AND PRESERVING ALCOHOLIC SPECIMENS.

a. Tanks and jars:

Agassiz collecting-tank.

47. APPARATUS FOR MAKING AND PRESERVING ALCOHOLIC SPECIMENS—Continued.

a. Tanks and jars :

Army collecting-tank.

Museum storage-tank, Agassiz model.

Anatomical jars.

Self-sealing jars, used in collecting.

Phials.

Tube-phials.

b. Syringes for injecting.*c.* Inflatable bags.*d.* Preservative mixtures:

Alcohol.

Glycerine.

Carbolic acid.

Chloral hydrate.

Picric acid.

Osmic acid.

e. Labels :

Metallic labels.

Parchment labels.

Indelible inks, pencils, &c.

48. APPARATUS FOR PRESERVING AND MAKING SKELETONS.

a. Preparation of the bones :

Macerating-vats.

Boiling-vats.

Cleansing and bleaching preparation.

b. Mounting of the bones :

Scraping-tools.

Articulating-tools.

49. APPARATUS FOR MAKING CASTS. MODELING.

a. Materials :

Clays.

Plasters.

Glues.

Papier-maché and *carton pierre*.

Gelatine.

Paraffine.

Collodion.

49. APPARATUS FOR MAKING CASTS, &c.—Continued.

b. Frames and modeling tools.

c. Molds :

Of plaster.

Of gelatine.

Of paper.

Of paraffine.

50. APPARATUS AND METHODS OF MAKING AND MOUNTING SKINS. TAXIDERMISTRY.

a. Tools :

Flaying-tools.

Scraping-tools.

Taxidermists' tools for stuffing :

Forceps.

Pliers.

b. Preservatives and insect-powders :

Arsenic and arsenical soap.

Corrosive sublimate.

Salt, alum, &c.

Persian insect-powder.

Syringes for application of insect-powder.

Tobacco, snuff, used as preservatives.

c. Frames, &c. :

Wooden frames.

Wire frames.

Plaster model-bodies.

51. (ACCESSORY.) PHOTOGRAPHIC AND OTHER DELINEATING APPARATUS.

a. Photographic apparatus :

Lenses.

Cameras and fittings.

Camera tripods and stands, with model.

Fish Commission stands.

Plates, and their results :

Wet plates.

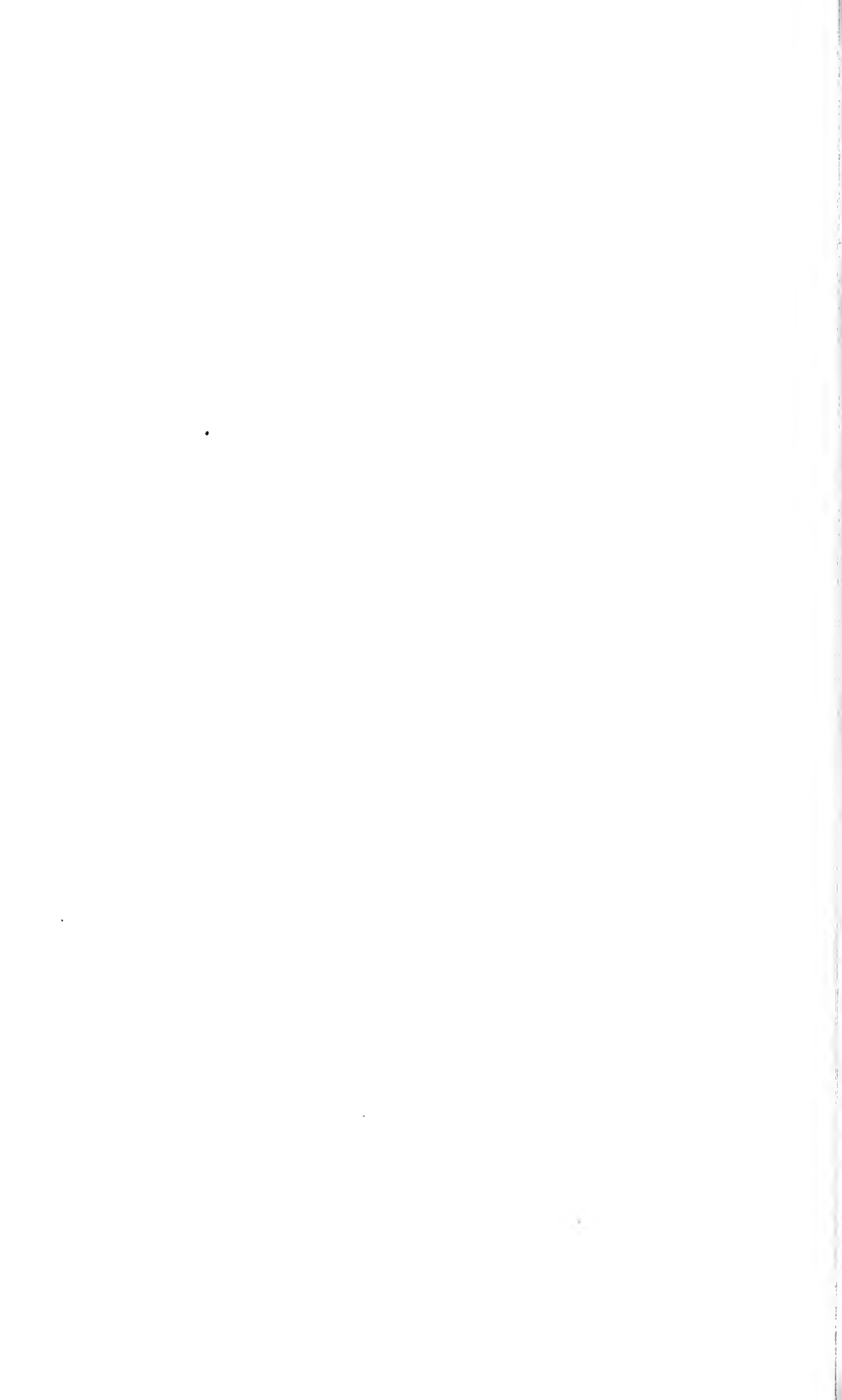
Dry plates.

Dark closets.

b. Camera obscuras.

c. Mechanical delineators.

d. Methods of heliotyping and engraving illustrations.



SECTION D.

ANIMAL PRODUCTS AND THEIR APPLICATIONS.

I. FOODS.

1. FOODS IN A FRESH CONDITION.

This section may include specimens of the marketable animals in a fresh condition in refrigerators.

For convenience in making up and arranging this portion of the collection, a list is appended of the animals used as food in the United States. Many others are available, but for various reasons are not commonly eaten.

a. Mammals:

Grizzly bear, (*Ursus horribilis*.)

Black bear, (*Ursus americanus*.)

White bear, (*Thalarchos maritimus*.)

Raccoon, (*Procyon lotor*.)

Buffalo, (*Bison americanus*.)

Musk-ox, (*Oribos moschatus*.)

Mountain goat, (*Mazama montana*.)

Mountain sheep, (*Ovis montana*.)

Antelope, (*Antilocapra americana*.)

Moose, (*Alces malchis*.)

Woodland caribou, (*Tarandus rangifer*, subsp. *caribou*.)

Barren-ground caribou, (*Tarandus rangifer*, subsp. *grænlædicus*.)

Elk or wapiti, (*Cervus canadensis*.)

Virginia deer, (*Cariacus virginianus*.)

Mule-deer, (*Cariacus macrotis*.)

Black-tailed deer, (*Cariacus columbianus*.)

Peccary, (*Dicotyles torquatus*.)

Manatee, (*Trichechus manatus*.)

Fox squirrel, (*Sciurus cinereus*.)

Gray squirrel, (*Sciurus carolinensis*.)

1. FOODS IN A FRESH CONDITION—Continued.

a. Mammals:

- California gray squirrel, (*Sciurus fessor.*)
- Tuft-eared squirrel, (*Sciurus Aberti.*)
- Red squirrel, (*Sciurus hudsonius.*)
- Flying squirrel, (*Sciuropterus volucella.*)
- Woodchuck, (*Arctomys monax.*)
- Marmots, (*Arctomys caligatus* and *flaviventer.*)
- Polar hare, (*Lepus timidus*, var. *arcticus.*)
- Prairie hare, (*Lepus campestris.*)
- Northern hare or white rabbit, (*Lepus americanus*, and *L. americanus* var. *virginianus.*)
- Red hare, (*Lepus americanus*, var. *Washingtoni.*)
- Baird's hare, (*Lepus americanus*, var. *Bairdii.*)
- Gray hare or gray rabbit, (*Lepus sylvaticus.*)
- Sage rabbit, (*Lepus sylvaticus*, var. *Nuttalli.*)
- Audubon's hare, (*Lepus sylvaticus*, var. *Auduboni.*)
- Trowbridge's hare, (*Lepus Trowbridgei.*)
- Jack rabbit or mule rabbit, (*Lepus callotis.*)
- California hare, (*Lepus californicus.*)
- Marsh hare, (*Lepus palustris.*)
- Water hare, (*Lepus aquaticus.*)
- Opossum, (*Didelphys virginiana.*)

b. Birds:

- Reed bird or rice bird, (*Dolichonyx oryzivorus.*)
- Wild pigeon, (*Ectopistes migratorius.*)
- Turkey, (*Meleagris gallopavo.*)
- Wild turkey, (*Meleagris gallopavo*, var. *americana.*)
- Spruce grouse, (*Tetrao canadensis.*)
- Dusky grouse, (*Tetrao obscurus.*)
- Sage cock, (*Centrocercus urophasianus.*)
- Sharp-tailed grouse, (*Pediæcetes phasianellus.*)
- Prairie grouse or prairie hen, (*Cupidonia cupido.*)
- Ruffed grouse, (*Bonasa umbellus.*)
- Snow ptarmigan, (*Lagopus albus.*)
- Rock ptarmigan, (*Lagopus rupestris.*)
- White-tailed ptarmigan, (*Lagopus leucurus.*)
- Bob-white or "quail," (*Ortyx virginianus.*)
- Plumed partridge, (*Oreortyx pictus.*)

1. FOODS IN A FRESH CONDITION—Continued.

b. Birds:

- California partridge, (*Lophortyx californicus*.)
- Gambel's partridge, (*Lophortyx Gambeli*.)
- Scaled partridge, (*Callipepla squamata*.)
- Massena partridge, (*Cyrtonyx massena*.)
- Black-billed plover, (*Squatarola helvetica*.)
- Golden plover, (*Charadrius fulvus* var. *virginicus*.)
- Kildeer plover, (*Aegialitis vociferus*.)
- Wilson's plover, (*Aegialitis wilsonius*.)
- Ringneck plover, (*Aegialitis semipalmatus*.)
- Piping plover, (*Aegialitis melodus*.)
- Stilt sandpiper, (*Micropalama himantopus*.)
- Ruddy plover, (*Calidris arenaria*.)
- Woodcock, (*Philohela minor*.)
- American snipe, (*Gallinago wilsoni*.)
- Red-breasted snipe, (*Macrorhamphus griseus*.)
- Willet, (*Totanus semipalmatus*.)
- Tell-tale, (*Totanus melanoleucus*.)
- Yellow-shanks, (*Totanus flavipes*.)
- Upland plover, (*Actiturus bartramius*.)
- Long-billed curlew, (*Numenius longirostris*.)
- Hudsonian curlew, (*Numenius hudsonicus*.)
- Eskimo curlew, (*Numenius borealis*.)
- Clapper rail, (*Rallus longirostris*.)
- Marsh hen, (*Rallus elegans*.)
- Virginia rail, (*Rallus virginianus*.)
- Carolina rail, (*Porzana carolina*.)
- Yellow rail, (*Porzana noveboracensis*.)
- Trumpeter-swan, (*Cygnus buccinator*.)
- Whistling swan, (*Cygnus americanus*.)
- White-fronted goose, (*Anser albifrons*.)
- Snow goose, (*Anser hyperboreus*.)
- Brant, (*Branta bernicla*.)
- Canada goose, (*Branta canadensis*.)
- Mallard, (*Anas boschas*.)
- Black duck, (*Anas obscura*.)
- Pintail duck, (*Dafila acuta*.)
- Gray duck, (*Chaulelasmus streperus*.)

1. FOODS IN A FRESH CONDITION—Continued.

b. Birds:

- Widgeon or bald pate, (*Mareca americana*.)
 Green-winged teal, (*Querquedula carolinensis*.)
 Blue-winged teal, (*Querquedula discors*.)
 Red-breasted teal, (*Querquedula cyunoptera*.)
 Shoveller, (*Spatula clypeata*.)
 Wood duck, (*Aix sponsa*.)
 Big black-head, (*Fuligula marila*.)
 Little black-head, (*Fuligula affinis*.)
 Ring-necked duck, (*Fuligula collaris*.)
 Red-head, (*Fuligula ferina*, var. *americana*.)
 Canvas-back, (*Fuligula vallisneria*.)
 Golden-eye, (*Bucephala clangula*.)
 Barrow's golden-eye, (*Bucephala islandica*.)
 Butter-ball, (*Bucephala albeola*.)
 Long-tail duck, (*Harelda glacialis*.)
 Harlequin-duck, (*Histrionicus torquatus*.)
 Eider duck, (*Somateria mollissima*.)
 King eider, (*Somateria spectabilis*.)
 Scoter, (*Edemia americana*.)
 Velvet duck, (*Edemia fusca*, var. *velvetina*.)
 Surf duck, (*Edemia perspicillata*.)
 Long-billed scoter, (*Edemia perspicillata* var. *Trowbridgei*.)
 Ruddy duck or bar duck, (*Erismatura rubida*.)
 Sheldrake, (*Mergus merganser*.)
 Red-breasted merganser, (*Mergus serrator*.)
 Hooded merganser, (*Mergus cucullatus*.)

c. Reptiles:

- Gopher tortoise, (*Testudo carolina*.)
 Diamond-back terrapin, (*Malacoclemmys palustris*.)
 Red-bellied terrapins, (*Pseudemys rugosa*.)
 Florida river-terrapin, (*Pseudemys concinna*.)
 Alligator turtle, (*Macrochelys lacertina*.)
 Snapping turtle, (*Chelydra serpentina*.)
 Soft-shell, or leather-back turtle, (*Aspionectes ferox*, &c.)
 Green turtle, (*Chelonia mydas*.)
 Pacific green turtle, (*Chelonia virgata*.)
 Loggerhead turtle, (*Thalassochelys caouana*.)

1. FOODS IN A FRESH CONDITION—Continued.

d. Amphibians:

Frogs, (*Rana catesbiana*, *clamitans*, &c.)

e. Fishes, (eastern coast:)

File fish, (*Balistes caprisceus*.)

American sole, (*Achirus lineatus*.)

Flat fish, (*Pseudopleuronectes americanus*.)

Smooth flounder, (*Pleuronectes glaber*.)

Sand flounder, (*Lophopsetta maculata*.)

Flounder, (*Chænopsetta ocellaris*.)

Southern flounder, (*Chænopsetta dentata*.)

Four-spotted flounder, (*Chænopsetta oblonga*.)

Halibut, (*Hippoglossus americanus*.)

Newfoundland "Turbot," (*Reinhardtius hippoglossoides*.)

Pollack, (*Pollachius carbonarius*.)

Cod, (*Gadus morrhua*.)

Tom-cod, or frost fish, (*Microgadus tomcodus*.)

Haddock, (*Melanogrammus aeglefinus*.)

Hake, (*Phycis chuss*.)

Squirrel hake, (*Phycis tenuis*.)

Cusk, (*Brosmus americanus*.)

Whiting, (*Merluccius bilinearis*.)

Norway haddock, (*Sebastes norregicus*.)

Rose fish, (*Sebastes viviparus*.)

Tautog, or black-fish, (*Tautoga onitis*.)

Chogset, or cunner, (*Tautoglabrus adspersus*.)

Hog fish, (*Lachnolaimus falcatus*.)

Angel fish, (*Holocanthus ciliaris*.)

Sword fish, (*Xiphias gladius*.)

Spear fish, (*Tetrapturus albidus*.)

Sail fish, (*Histiophorus americanus*.)

Mackerel, (*Scomber scombrus*.)

Chub mackerel, (*Scomber colias*.)

Bonito, (*Sarda pelamys*.)

Horse mackerel, (*Oreocynus secundi-dorsalis*.)

Spanish mackerel, (*Cybius maculatum*.)

Cero, (*Cybius caballa*.)

Striped cero, (*Cybius regale*.)

Crevallé. (*Carangus hippos* and *Paratractus pisquetus*.)

1. FOODS IN A FRESH CONDITION—Continued.

e. Fishes, (eastern coast:)

- Pompano, (*Trachynotus carolinus*.)
 Short pompano, (*Trachynotus oratus*.)
 Butter-fish, (*Poronotus triacanthus*.)
 Squeteague, (*Cynoscion regalis*.)
 Spotted squeteague, (*Cynoscion carolinensis*.)
 Drum, (*Pogonias chromis*.)
 Spot, (*Liostomus obliquus*.)
 Silver perch, or yellow-tail, (*Bairdiella punctata*.)
 Red fish, or spotted bass, (*Sciaenops ocellatus*.)
 King fish, (*Menticirrhus nebulosus*.)
 Southern king fish, or Bermudā whiting, (*Menticirrhus albur
nus*.)
 Croaker, (*Micropogon undulatus*.)
 Sailor's choice, (*Lagodon rhomboides*.)
 Sheeps-head, (*Archosargus probatocephalus*.)
 Scuppaug, or porgy, (*Stenotomus argyrops*.)
 Grunts, (*Hæmulon arcuatum*, &c.)
 Gray snapper, (*Lutjanus caris*.)
 Red snapper, (*Lutjanus aya*.)
 Grouper, (*Epinephelus morio*.)
 Spotted grouper, (*Epinephelus guttatus*.)
 Jew fish, (*Promicrops quasa*.)
 Sea bass, (*Centropristis atrarius*.)
 Squirrel, (*Diplectrum fasciculare*.)
 Striped bass or rock fish, (*Roccus lineatus*.)
 White perch, (*Morone americana*.)
 Moon fish, (*Parcephippus quadratus* and *P. faber*.)
 Triple-tail, (*Lobotes surinamensis*.)
 Blue fish, (*Pomatomus saltatrix*.)
 Striped mullet, (*Mugil lineatus*.)
 Silver-sides, (*Chirostoma notatum*.)
 Silver gar fish, (*Belone longirostris*.)
 Skipper, (*Scomberesox scutellatus*.)
 Mummichogs, (*Hydrargyra majalis*, &c.)
 Capelin, (*Mallotus villosus*.)
 Smelt, (*Osmerus mordax*.)
 Salmon, (*Salmo salar*.)

1. FOODS IN A FRESH CONDITION—Continued.

e. Fish, (eastern coast:)

- Sea trout, (*Salmo immaculatus*.)
- Tarpon, (*Megalops thrissoides*.)
- Menhaden, (*Brevoortia menhaden*.)
- Shad, (*Alosa sapidissima*.)
- Alewife, or gaspereau, (*Pomolobus pseudoharengus*.)
- Tailor herring, (*Pomolobus mediocris*.)
- Herring, (*Clupea harengus*.)
- Mud shad, (*Dorosoma cepedianum*.)
- Anchovy, (*Engraulis vittatus*, &c.)
- Sea eel or conger, (*Conger oceanica*.)
- Eel, (*Anguilla bostoniensis*.)
- Sturgeon, (*Acipenser oxyrhynchus* and *A. brevirostris*.)
- Lamprey eel, (*Petromyzon americanus*.)

f. Fishes, (fresh waters:)

- Burbot or lawyer, (*Lota maculosa*.)
- Fresh-water drum, (*Haploidonotus grunniens*.)
- Small-mouthed black-bass, (*Micropterus salmoides*.)
- Large-mouthed black-bass, (*Micropterus floridanus*.)
- Rock-bass, (*Ambloplites rupestris*.)
- Sacramento "perch," (*Archoplites interruptus*.)
- Sun-fish, (*Pomotis aureus*.)
- Black-eared sunfish, (*Pomotis auritus*.)
- "Bream" of Southern States, (*Calliurus*, *Lepomis*, *Enneacanthus*, *Channobryttus*, numerous species.)
- Strawberry or grass bass, (*Hyperistius hexacanthus*, and *Pomoxys storerius*.)
- Yellow perch, (*Perca flavescens*.)
- Yellow pike-perch, (*Stizostedium americanum*.)
- Gray pike-perch or sauger, (*Stizostedium griseum*.)
- Canada pike-perch, (*Stizostedium canadense*.)
- White bass, (*Roccus chrysops*.)
- Short-striped bass, (*Morone interrupta*.)
- Lake pike, (*Esox lucius*.)
- Pickarel, (*Esox reticulatus*, *E. fasciatus*, *E. cypho*, &c., &c.)
- Masquallonge, (*Esox nobilior*.)
- Brook trout, (of eastern slope,) (*Salmo fontinalis*.)
- Brook trout, (of western slope,) (*Salmo iridea*.)

1. FOODS IN A FRESH CONDITION—Continued.

f. Fish, (fresh waters:)Utah trout, (*Salmo virginalis*.)Oquassa trout, (*Salmo oquassa*.)Lake trout, (*Salmo confinis*.)Salmon trout or Mackinaw trout, (*Salmo namaycush*.)Siscowet, (*Salmo siscowet*.)Sebago salmon, (*Salmo sebago*.)Missouri trout, (*Salmo Lewis*.)White fish, (*Coregonus albus*.)Otsego white fish, (*Coregonus otsego*.)Lake herring, (*Argyrosomus harengus* and *A. clupeiformis*.)Black fin of Lake Michigan, (*Argyrosomus nigripinnis*.)Michigan grayling, (*Thymallus tricolor*.)Mountain grayling, (*Thymallus montanus*.)Suckers of eastern slope, (*Catostomus teres*, &c., *Ptychostomus aureolus*, &c.)Suckers of western slope, (*Catostomus occidentalis*, &c.)Fall fish, (*Semotilus rhotheus*.)Chubs of eastern slope, (*Semotilus corporalis*, &c.)Chubs of western slope, (*Lavinia exilicauda*, *Algansea*, sp., &c.)"Pike" or "salmon trout" of California, (*Ptychocheilus grandis*, &c., *Pogonichthys inaequilobus*, &c.)Dace, (*Ceraticthys biguttatus*, &c.)Buffalo fish, (*Bubalichthys bubalus*.)Shiner, (*Stilbe americana*.)Carp, (*Carpiodes cyprinus*, &c.)Catfishes, (*Amiurus catus*, *A. nigricans*, &c., *Ictalurus cærulesceus*, &c., and many other siluroid fishes.)Sturgeon of the lakes, (*Acipenser rubicundus*.)Shovel-nose sturgeon, (*Scaphirhynchops platyrhynchus*.)*g.* Fishes, (western coast:)Flounders, (*Platichthys stellatus*, *Lepidopsetta umbrosa*, &c.)"Soles," (*Parophrys retulus*, *Psettichthys melanostictus*, &c.)Halibut, (*Uropsetta californiana*, *Hippoglossus*, sp., &c.)Tomcod, (*Microgadus proximus*.)Cod of Alaska, (*Gadus macrocephalus*.)Rock fish or "rock cod," (*Sebastomus rosaceus* and species of *Sebastosomus*, *Sebastichthys*, &c.)

1. FOODS IN A FRESH CONDITION—Continued.

g. Fishes, (western coast :)

Rock trout, (*Chirus constellatus*.)

"Cod" of San Francisco, (*Ophiodon elongatus*.)

Black fish or "sheeps-head," (*Pimelometopon pulcher*.)

"Perch," (numerous species of *Embiotoca*, *Holconotus*, &c.)

"Bass," (*Atractoseion nobilis*.)

Cognard or little bass, (*Genyonemus lineatus*.)

San Francisco "smelt," (*Atherinopsis californiensis*.)

Pacific smelt, (*Osmerus elongatus*.)

Salmon, (*Salmo quinnat*, &c.)

Oulachan, (*Thaleichthys pacificus*.)

Sardine or pilchard, (*Pomolobus caeruleus*.)

Herring, (*Clupea mirabilis*.)

Sturgeon, (*Acipenser acutirostris*, &c.)

Columbia River sturgeon, (*Acipenser transmontanus*.)

h. Crustaceans.¹

i. Mollusks.¹

2. FOODS: DRIED AND SMOKED.

a. Mammal preparations :

Jerked bear-meat.

Jerked seal and walrus meat, (Indian.)

Jerked and smoked buffalo-meat.

Dried and smoked beef.

Dried and smoked venison.

Hams of various kinds.

Jerked porpoise-meat, (Indian.)

Jerked squirrels and other small mammals.

Pemmican.

Meat-biscuit, desiccated meat, meat extract, (*extractum carnis*),
desiccated milk, &c.

Sausages.

Cheese.

b. Bird preparations :

Jerked birds, (Indian.)

¹The various applications of these groups are enumerated in the "List intended to give a general idea of the useful products (other than vertebrates) of the sea and shore, as well as of the interior waters of the United States," prepared by Mr. WM. H. DALL, and printed as Circular No. 2 of series (C,) National Museum series.

2. FOODS: DRIED AND SMOKED—Continued.

c. Reptile preparations :

Dried lizards, (Indian.)

d. Fish preparations :

Smoked halibut.

Dried cod, haddock, hake, &c.

Dried and smoked mullet and roes.

Dried and smoked garfish, flying-fish, &c.

Smoked herring, alewives, &c., and their roes.

Smoked salmon, oulachan, white-fish, smelt, &c., and their roes.

Smoked sturgeon.

Veziga, prepared from the notochord of sturgeons.

e. Insects :

Dried grasshoppers, (Indian.)

f. Worms :

Dried worms, (Indian.)

g. Mollusk preparations :

Dried abalones, (*Haliotis*,) prepared by the California Chinese.

Dried siphons of *Schizothærus* prepared by the Indians of the northwest coast.

Dried slugs, (*Limax*, &c.,) used by Indians.

h. Radiate preparations :

(Dried holothurians, "bêches de mer," used by Chinese.)

i. Protozoans :

("Mountain meal," a kind of infusorial earth, mixed with flour, and used as food in Lapland and China.)

3. FOODS: SALTED, CANNED, AND PICKLED.

a. Mammal preparations :

Salted buffalo-meat.

Salted beef.

Salted deer, reindeer, elk.

Salted tongues of beef, buffalo, deer, horse.

Salted pork.

Canned milk of the various brands.

b. Bird preparations :

Canned turkey.

Canned chicken.

Canned goose.

3. FOODS: SALTED, CANNED, AND PICKLED—Continued.

b. Bird preparations:

(Canned ortolans, (*Emberiza hortularia*,) esteemed a delicacy in Cyprus.)

c. Reptile preparations:

Salted and canned turtles and turtle soup.

Canned frogs.

d. Fish preparations:

Salted halibut, halibuts' fins, &c.

Salted cod, cods' tongues, sounds, and roe.

Salted mackerel.

Salted Spanish mackerel.

Salted bluefish.

Salted pompano.

Salted sword-fish.

Salted mullets.

Salted salmon.

Salted white-fish.

Salted trout.

Salted shad.

Salted herring.

Salted gaspereau.

Salted menhaden.

Salted anchovies.

(Spiced lampreys) used in Europe.

Anchovy-sauce and "essence of anchovies."

Canned menhaden, in oil, "American sardines."

Canned menhaden, in oil, "American club-fish."

Spiced menhaden, "ocean trout."

Canned herring, in oil, "Russian sardines."

Caviare, prepared from roe of the various sturgeons.

(Caviare, prepared from roe carps, used by Jews.)

("Boutargue" or "botargo" prepared on the Mediterranean from the roes of *Labrax* and *Mugil*.)

e. Crustacean preparations:

Canned lobsters.

Canned crabs.

Canned prawns and shrimps.

f. Mollusk preparations:

Canned oysters.

3. FOODS: SALTED, CANNED, AND PICKLED—Continued.

f. Mollusk preparations:

Canned clams.

Canned little-neck clams.

Canned scollops.

(Cockles, (*Cardium edule*,) used in Europe as pickles and catsup.)

4. GELATINES.

a Mammal gelatines, (see also under 24 :)

Gelatines made from tanners refuse and from sinews.

Gelatines made from feet and hoofs.

Gelatines made from bone and ivory shavings.

b. Bird gelatines:

(Nests of esculent swallows, (*Calocalia esculenta*, *C. fueiphaga*, *C. indifica*, &c.,) exported from Indian Archipelago to China.)

c. Fish gelatines or isinglass, (see also under 24.)

d. Insect gelatine:

Gelatine from cocoons of silk-worms.

5. BAITS AND FOODS FOR ANIMALS.

a. Prepared baits, (see under B, 45.)

b. Food for domesticated animals:

Oil-factory scraps.

Fish-scraps.

Cuttle-fish bone, (see under 18.)

II. CLOTHING.

6. FURS, (embracing the furs in their rough state, (*peltries*,) and in the various stages of preparation; also the manufactured articles, such as robes, rugs, cloaks, sacks, tippets, cuffs, muffs, hats, caps, gloves, trimmings and linings.)¹

a. Mammal furs:

(Diana monkey, (*Cercopithecus diana*,) of West Africa.)(Black monkey, (*Colobus polycomus*, and other species,) of West Africa—trimmings, &c.)(Abyssinian monkey, (*Colobus guereza*,))

¹ Note.—For convenience in arranging the general collections of the museum, this list has been made unusually full, and includes all furs known to be found in American and European markets.

6. FURS—Continued.

a. Mammal furs:

(American howling-monkey, (*Myecetes*, several species)—muffs.)

(Lion, (*Felis leo*), of Africa and Asia—rugs.)

(Tiger, (*Felis tigris*)—rugs, &c.)

(Leopard, (*Felis pardus*)—rugs and saddle-cloths.)

Puma, (*Felis concolor*)—carriage-robcs, rugs, &c.

Ocelot, (*Felis pardalis*)—rugs.

Jaguar, (*Felis onca*)—rugs.

Cat, (*Felis domestica*)—robcs and philosophical apparatus.

Black cat.

White cat.

Maltese cat.

Tortoise-shell.

(Wild-cat, (*Felis catus*), of Europe and Asia—robcs and linings.)

(Snow leopard, (*Felis irbis*), of Asia.)

Eyra, (*Felis eyra*.)

Yaguarundi, (*Felis yaguarundi*.)

(Cheetah, (*Cynailurus jubatus*), of India and Southern Asia.)

Bay lynx, (*Lynx rufus*)—rugs, and, when dyed, muffs and
boas.

Canada lynx, (*Lynx canadensis*)—rugs and trimmings, and
dyed muffs, boas, &c.

Dog, (*Canis familiaris*.)

Eskimo dog.

Wolf, (*Canis lupus*)—linings, rugs, and robcs.

White wolf.

Black wolf.

Gray wolf.

“Blue wolf.”

Red wolf.

Coyote, or prairie wolf, (*Canis latrans*)—rugs and robcs.

(Jackal, (*Canis aureus*), of Old World.)

Red fox, (*Vulpes alopec*, var. *fulrus*)—robcs, (mostly imported
to Turkey.)

Cross fox, (*Vulpes alopec*, var. *decussatus*)—robcs, trimmings.

Black and silver fox, (*Vulpes alopec*, var. *argentatus*)—muffs,
cloaks, trimmings; also, fox-skins dyed to imitate lynx;
also, various imitations of silver-fox, made from skins of
more common varieties.

6. FURS—Continued.

a. Mammal furs:

Arctic fox, (*Vulpes lagopus*.)

White fox.

Blue fox.

Kit fox, (*Vulpes velox*)—robes, muffs, trimmings.

(Cossac fox, (*Vulpes corsac*,) of Asia.)

(Mountain fox, (*Vulpes montanus*,) of India.)

Gray fox, (*Urocyon virginianus*)—rugs, robes, and linings.

(Spotted hyena, (*Hyæna crocuta*,) of West and South Africa.)

(Striped hyena, (*Hyæna striata*,) of West Africa and India.)

Fisher or pekan, (*Mustela Pennanti*)—linings, tails used for trimmings.

American or Hudson's Bay sable, (*Mustela americana*)—cloaks, muffs, cuffs, boas, linings, &c.:

Silver variety.

Orange variety.

Brown or common variety.

(Russian sable, (*Mustela zibellina*,) of North Europe and Asia—cloaks, muffs, boas, linings, &c.)

(Tartar sable, or kolinsky, (*Mustela sibirica*)—cloaks, muffs, and dyed to imitate Russian sable.)

(Pine marten, (*Mustela abietum*,) of North Europe and Asia.)

(Stone marten, or French sable, (*Mustela saxorum*,) of Europe—dyed to imitate sable.)

(Beech marten, (*Mustela foina*,) of Europe and Asia—dyed to imitate sable.)

(Polecat, fitch, or ferret, (*Putorius vulgaris*,) of Europe and Asia.)

Ermine, or weasel, (*Putorius erminea*,) of Northern Hemisphere—cloaks, linings, &c.:

Royal ermine, trimmed with astrakhan fur, (miniver.)

Siberian ermine.

Long-tailed weasel, (*Putorius longicauda* :)

Summer dress.

Winter dress.

Mink, (*Putorius vison*,)—cloaks, muffs.

Wolverine, (*Gulo luscus*,)—muffs, robes, linings.

American badger, (*Taxidea americana*)—muffs and rugs.

6. FURS—Continued.

a. Mammal furs:

(European badger, (*Meles vulgaris*)—muffs and rugs.)

Skunk, Alaska sable, (*Mephitis mephitis*)—muffs, boas, &c.

White-backed skunk, (*Conepatus mapurito*.)

Striped skunk, (*Spilogale putorius*.)

Otter, (*Lutra canadensis*), with specimens of the plucked and dyed fur—muffs, trimmings, &c.

Sea otter, (*Enhydra marina*)—muffs, gloves, collars, cuffs, trimmings.

Black bear, (*Ursus americanus*)—caps, rugs, muffs, robes, &c.

a'. Cinnamon variety.

b. Silvery variety.

(Brown bear, (*Ursus arctos*), of Europe and Asia.)

Grizzly bear, (*Ursus horribilis*)—rugs, robes, trimmings.

White bear, (*Thalarctos maritimus*)—rugs, robes, and used extensively by the Eskimos.

Raccoon, (*Procyon lotor*)—hats, linings.

Fur-seal, (*Callorhinus ursinus*)—cloaks, hats, gloves, muffs, linings, trimmings, &c.

Cub fur.

(Antarctic fur-seal, (*Arctocephalus aucklandicus*, &c.)

Hair seal, (*Phoca vitulina* and *Phoca Richardsii*)—coats, caps, linings for shoes.

Harp seal, (*Pagophilus grælandicus*), with specimens of the white fur of the unborn cub, and the blue fur of the young.

Hood seal, or bladder-nose, (*Cystophora cristata*.)

Square flipper, or bearded seal, (*Erignathus barbatus*), with specimens of fur dyed to imitate leopard.

Banded seal, (*Histiophoca equestris*)—used by Eskimos as fur.

Gray seal, (*Fusa gryphus*.)

Ringed seal, (*Pagomys fœtidus*.)

Bison, or buffalo, (*Bison americanus*)—rugs and robes.

a'. Mountain bison.

b. Common bison.

Musk-ox, (*Ovibos moschatus*)—robes, rugs, and trimmings.

(Yak, (*Poëphagus grunniens*), of Asia—robes and trimmings.)

Mountain goat, (*Aplocerus montanus*)—robes, &c.

6. FURS—Continued.

a. Mammal furs:

(Llama, guanaco, paco, and vicugna, (*Auchenia*, sp.)—trimmings, &c.)

Goat, (*Capra*, sp.)—rugs, trimmings.

a'. Angora goat.

b. Cashmere goat.

c. Other varieties.

Sheep, (*Ovis aries*)—rugs, trimmings, &c.

a. Astrakhan sheep.

b. Caracoul sheep.

c. Other varieties. Lamb-skins and dyed furs.

Antelope, (*Antilocapra americana*)—rugs.

Moose, (*Alces malchis*)—rugs and robes.

Elk, (*Cervus canadensis*)—rugs and robes.

Reindeer, (*Tarandus rangifer*)—robes, coats, gloves, &c.

Caribou, (*Tarandus rangifer* var.)—robes, coats, gloves.

Mule deer, (*Cariacus macrotis*)—trimmings, robes.

Virginia deer (*Cariacus virginianus*)—trimmings, robes.

Mole, (*Scalops* and *Condylura*, sp.)—robes, garments.

(European mole, (*Talpa europaea*)—robes, garments.)

Woodchuck, or siffleur, (*Arctomys monax*)—robes, exported to Europe as "white and gray weenusk."

Marmot, (*Arctomys caligatus*)—robes, trimmings.

Parry's marmot, (*Spermophilus Parryi*)—robes, trimmings.

Gray squirrel, (*Sciurus carolinensis*, &c.)—trimming; tails used for boas.

(Squirrel, or "calabar," (*Sciurus vulgaris*,) Northern Europe and Asia.)

a'. Siberian squirrel. Trimmings, muffs, capes, &c.; tails used for boas, dyed to imitate sable.

b. "Weisenfels linings" of the white fur of the belly.

Show'tl, (*Haplodontia leporina*)—used by Indians.

(Chinchilla, (*Chinchilla laniger*,) of South America—muffs, mantles, boas, cloak-linings, and trimmings.)

Musquash, (*Fiber zibethicus*)—muffs, capes, caps, and linings, and imitations of beaver-fur.

(Neutria, or Coypu, (*Myopotamus coypus*)—linings and muffs, and imitations of beaver.)

6. FURS—Continued.

a. Mammal furs :

(Beaver, (*Castor fiber*,) of Northern Europe and Asia.)

Beaver, (*Castor canadensis*)—linings and muffs.

White beaver.

Spotted beaver.

Rats and mice, (*Mus.*, sp. var.)

Lemming, (*Myodes torquatus* and *obensis*)—robes.

Rabbit, or cony, (*Lepus cuniculus*)—children's furs, and imitations of seal, beaver, &c., exported largely to China.

White variety.

Blue variety.

Brown variety.

American native rabbit furs, such as *Lepus glacialis*, used for muffs, boas, and feltings.

Possum, (*Didelphys virginiana*.)

(Kangaroo, (*Macropus giganteus*,) of Australia.)

(Ornithorhynchus, (*Ornithorhynchus anatinus*,) of Australia.)

b. Skins of birds used as furs :

Turkey furs, (*Melagris gallopardo*, &c.)

Gull furs, (*Larus argentatus*, &c.)

Grebe furs, (*Podiceps aristatus*, &c.)

Loon furs, (*Colymbus torquatus*, &c.)

Swan furs and swan's down trimmings, (*Cygnus americanus*, &c.)

Pelican furs, (*Pelecanus fuscus*, &c.)

Adjutant crane, (*Eiconia argala*)—feathers used as fur.

Puffin furs, (*Fratercula arctica*, &c.)

Penguin furs, (*Aptenodytes*, *Pennantii*, &c.)

Feathers of common fowl used in trimmings.

7. LEATHERS. (See under 20.)

8. TEXTILE FABRICS.

a. Prepared from hair of mammals :

Human hair used in manufacture of watch-chains.

Hair of bats used in felting and in plaiting ropes in Central America and tassels in New Caledonia.

Hair of raccoon used in felting, (largely exported to Germany for the use of hatters.)

Hair of weasels and sables used in felting.

8. TEXTILE FABRICS—Continued.

a. Preparations of hair of mammals:

Hair of ~~fur~~ seal woven with silk in the manufacture of shawls.

Moose hair and its fabrics.

Ox and calf hair used in the manufacture of imitation woolen goods.

Sheep's wool, with specimens of fleeces and stapled wools, from various breeds and localities, short-wool fabrics, broadcloths, merinoes, flannels, mouselins de laine, serges, tweeds, blankets, carpets, and tartans, worsted fabrics, stuffs, bombazines, camlets, shawls, plushes and velvets, hosiery, and yarns, felts, felt-cloths, and felt-hats.

Goats' wool with specimens of mohairs, cashmeres, plushes, velveteens, camlets, and shawls. (For manufactured wigs and perukes, see under 21.)

(Yak (*Poëphagus grunniens*) wool with specimens of yak-lace and other fabrics.)

(Camels' hair with specimens of fabrics, plushes, felts, shawls, &c.)

(Hair of llama, paco, guanaco, and vicugna, with specimens of alpaca, guanaco, and other fabrics, and umbrellas and other articles manufactured.)

Hair of horses used in weaving furniture-covers, crinoline-skirts, and bags for pressing oil.

Hair of buffalo used in plaiting ropes, lariats, &c.

Fur of mole used in felting.

Beaver (castor) fur with specimens of the felt cloths, hats, &c. (Neutria-fur used in felting and in the manufacture of hats.)

Musquash fur used in felting.

Possum hair with fabrics of Indian and other manufacture.

Fur of rabbit and hare used in felting, with specimens of hats and cloths.

Whalebone fiber used in weaving cloth covers for telescopes, &c.

b. Prepared from feathers of birds:

Cloths woven from feathers, (China.)

c. Prepared from silk of insects: (This collection should include specimens of the cocoons, the raw silk, the spun silk, and of the various fabrics, plain and figured silks, satins and satin-ettes, shawls, damasks, brocades, crapes, and ribbons.)

8. TEXTILE FABRICS—Continued.

c. Prepared from silk of insects:

Silk of common silk-worm, (*Bombyx mori*.)

Silk of *Samia cecropia*, *Samia polyphemus*, and other native American moths.

(Silk of exotic moths other than *Bombyx mori*, such as the tussah, (*Bombyx pernyi* and *Bombyx mylitta*,) the moonga, (*Saturnia assamensis*,) the joree, (*Bombyx religiosa*,) the ena or arindy, (*Bombyx cynthia*.)

Fabrics woven by the insects themselves, as *Tinea padilla*.

Silk of spiders.

d. Prepared from byssus of mollusks.

(Fabrics woven from byssus of the wing-shell (*Pinna nobilis*) and other mollusks.)

III. MATERIALS EMPLOYED IN THE ARTS AND MANUFACTURES.

* *Hard materials.*

9. IVORY AND BONE. (This collection should include specimens of the various ivories and bones in their rough state, and manufactured into buttons, trinkets, cutlery-handles, canes, pen and pencil handles, brush-handles, billiard and bagatelle balls, dice, piano-keys, harness-rings, combs, false-teeth, philosophical instruments, and as used by portrait painters and photographers.)

a. Ivory of mammals:

Tusks of walrus used for trinkets, handles, jewelry, buttons, paper-knives, counters, &c.

Teeth of bears, dogs, wolves, foxes, peccaries, and other large mammals, used as implements, arrow-tips, and ornaments, by Indians.

Elk-ivory used by Indians in ornamentation.

Tusks of mammoth elephant (*Elephas primigenius*) from northern America and Asia, with Eskimo carvings and specimens of "Siberian ivory."

9. IVORY AND BONE—Continued.

a. Ivory of mammals:

(Tusks of African elephant with specimens of sawed and scroll ivory and of the manufactured balls, combs, piano-keys, handles, rings, canes, buttons, trinkets, bangles, and miniature tablets.)

(Tusks of the Asiatic elephant and their applications.)

(Teeth of hippopotamus as used for handles for surgical instruments, index-fingers, and formerly for false-teeth, (trade-name, "sea-horse.")

Teeth of wild-hog used in manufacture of jewelry, vinal-grettes, &c.

Teeth of peccary.

Ivory of narwhal used for canes.

Teeth of sperm-whale and their application to the manufacture of balls, buttons, and trinkets.

Incisors of beaver used by Indians for chisels, knives, and ornaments.

b. Ivory of reptiles:

Teeth of alligator used for jewelry, whistles, cane-handles, buttons, &c.

c. Ivory of fishes:

Sharks' teeth used in arming weapons.

Teeth of sharks and other fish used as trinkets.

Jaws of the sleeper-shark (*Somniosus brevipinna*) used for head-dresses by Indians.

d. Bone of mammals:

Parts of splanchno-skeleton of ferae, used as charms.

Bones of bear and other large mammals, used by Indians for implements, and as tablets for paintings.

Bones of buffalo and of the domestic ruminants, used as substitute for ivory in the manufacture of buttons, handles, combs, &c.

Sperm-whale jaw-bone, used for harness-rings, martin-gales, &c.

Horn-cores of ruminants, used in manufacture of assayers' cupels.

e. Bone of birds:

Bones of birds, used by Indians and Eskimos in making awls, needles, flutes, bird-calls, and dress-trimmings.

• 9. IVORY AND BONE—Continued.

f. Bone of fishes:

Fish-bones, used by Indians and Eskimo in making implements.

Shark's vertebræ, used for canes.

Bones of sharks and skates, used (in Japan) in making imitation tortoise-shell.

g. Waste bone and ivory:

Use in manufacture of bone-black, ivory-black, and bank-note ink, (see under 29.)

Use in manufacture of sizes and glues, (see under 24.)

Use in manufacture of gelatine for food, (see under 4.)

Use in manufacture of phosphorus, carbonate of ammonia, (hartshorn,) and sal ammoniac, (see under 30.)

Use in manufacture of bone-charcoal for filters, (see under 30.)

Use in manufacture of paper.

Use of shavings in case-hardening gun-barrels and other fine steel.

10. HORN. (Embracing the varieties of horn known to commerce, the split and pressed horns, and the various manufactured articles, such as jewelry, combs, and handles.

a. Horn, employed as a material:

Horn of rhinoceros, used for handles and trinkets, cups, boxes, whips, and canes.

Horns of ox, sheep, and goat, used for handles, buttons, combs, powder-flasks, cups, boxes, stirrups, spoons, and imitations of tortoise-shell, also "sensitive Chinese leaves," and formerly for transparent plates in lanterns and horn-hooks, for trumpets, and for finger-nails in lay figures.

Horn of buffalo, used like that of ox.

(Horn of Asiatic buffalo, (*Bos bubalus*.))

Horn of mountain-sheep and mountain-goat, used by Aleutians, in making spoons, bowls, and numerous other implements.

b. Antlers:

Antlers of deer, elk, and moose, (stag-horn,) used in the manufacture of handles for instruments, trinkets, and buttons.

10. HORN—Continued.

b. Antlers:

Antlers of deer, elk, moose, and nearly all species of ruminants, employed for ornamental purposes.

c. Chemical and other applications:

Burnt horn, (*cornu ustum*,) used in dentifrices.

Carbonate of ammonia, (hartshorn,) manufactured from deer-horns, (see under 30.)

11. HOOFS AND CLAWS, &c. (Embracing the commercial hoof, and the various stages of manufacture represented by specimens.)

a. Hoofs:

Hoofs of ox and bison, used in making buttons, combs, and handles.

Hoofs of horse, used like those of ox and bison.

Hoofs of musk-ox, deer, and antelope, used by Indians in ornamentation.

Feet of deer, used for knife-handles, stool-feet, &c.

b. Claws:

Claws of bear, puma, wolf, &c., used by Indians in ornamentation.

(Claws of lion and tiger, used by jewelers for trinkets.)

Human nails, used by Indians for ornamental trimmings.

c. Chemical applications of hoofs and claws:

Use in manufacture of prussiate of potash, (see under 30.)

Use in manufacture of glue, (see under 24.)

12. BALEEN. (Embracing the commercial baleen in its various grades, *Greenland*, *Northwest Coast*, *South Sea*, *fin-back*, and *hump-back*, with the split, twisted, and dyed bone.)*a.* Whalebone, as used by manufacturers of ribbons, hats, umbrellas, whips, canes, boots, fishing-rods, billiard-tables, buttons, handles, brushes, surgical instruments, stays, corsets, crinolines, harness-rosettes, covers, stuffings, light woven hats and bonnets, &c.; also, imitation whalebone, (wallosin,) made from rattan.13. TORTOISE-SHELL. (Embracing the carapace entire, and the commercial shell, *blades*, *feet*, *noses*, and *head*.)

13. TORTOISE-SHELL—Continued.

- a. Shell of tortoise (*Eretmochelys imbricata*, *E. squamata*) used in manufacture of combs, handles, jewelry, inlaying, and buttons, together with imitations of tortoise-shell in horn, shark's bone, and celluloid.
- b. Shells of land tortoises, used by Indians for pots, scoops, and rattles.

14. SCALES.

- a. Shell of mammals:

Shell of armadillo, used by Texans and Mexicans.

- b. Scales of fishes used in ornamental work, with specimens of flowers and other articles manufactured:

Scales of parrot fishes, (*Scaridæ* and *Labridæ*.)

Scales of mullets, (*Mugilidæ*.)

Scales of sheepshead, &c., (*Sparidæ*.)

Scales of drum and bass, (*Sciaenidæ*.)

Scales of Serranidæ and perches, (*Percidæ* and *Labracidæ*.)

Scales of Lobotidæ.

Scales of tarpon, (*Elopidae*.)

Scales of herrings, (*Clupeidæ*.)

Scales of Cyprinidæ.

Scales of eels, used in the north of Europe to give a pearly luster in ornamental house-painting.

Scales of gar-pikes, used by Indians for arrow-tips.

(Pearl white, or *essence d'Orient*, prepared from scales of *Alburnus lucidus* and other Cyprinidæ and Clupeidæ, used in making artificial pearls.) (See under 27.)

Shagreen of trigger-fish, (*Balistes*,) used in polishing wood.

Shagreen of sharks, used as leather, (see under II, B. 5,) and for polishing purposes, particularly in the manufacture of quill pens.

Scales of sturgeons, used by Indians for implements.

For gelatine as a material and the arts and papier glacé, see 24.

15. PEARL.

- a. Pearls and naere, (embracing the pearl-yielding shells, with the pearls and the mother-o'-pearl in the rough state, with the manufactured buttons, handles, and jewelry, pearl-powder, inlaid work, and papier maché, ornamented with mother-o'-pearl:)

15. PEARL—Continued.

a. Pearls and nacre:

Top-shells, (*Turbinidæ*), and their application to manufacture of shell-flowers.

Tower-shells, (*Trochidæ*.)

Ear-shells, (*Haliotidæ*), used in manufacture of buttons, handles, inlaid work, and pearl-powder.

Other gastropods supplying nacre.

Pearl-oysters, (*Aviculidæ*), with pearls and nacre.

River-mussels, (*Unionidæ*), with pearls and nacre.

Mussels, oysters, and other conchifers supplying pearls and nacre.

Shells of nautilus and argonaut, prepared to exhibit their nacre.

Ornamental pearl-work, imitating sprays of flowers, &c.

Imitation pearls.

16. SHELL.

a. Cameo shell:

Shell of conch, (*Strombus gigas*), and carvings.

Shell of helmet, (*Cassis rufa*, *C. tuberosa*, and *C. madagascariensis*), with carvings.

b. Shells used for implements, &c.:

Shells of *Strombus*, *Triton*, *Dolium*, *Fusus*, *Murex*, and *Buccinum*, used for fog-horns, lamps, vases, and ornamental borders in flower-gardens.

Shells of *Busycon*, *Sycotypus*, *Mactra*, &c., used by Indians in manufacture of implements, with specimens of implements.

Shells of *Mactra*, used for ladles, scoops, and spoons by fishermen.

Shells of *Tridacna*, used for vases, fountains, and in the manufacture of handles and carvings.

Shells of *Pecten*, *Haliotis*, *Dentalium*, *Mercenaria*, &c., used by Indians for trimmings and ornaments.

(Scallop, or palmer's shell, (*Pecten jacobæus*), used as a decoration of honor.)

(Chunk shell, (*Turbinella pyrum*), used in the manufacture of Hindoo bangles, and in polishing cloth.)

Shells of *Pecten*, used in making pin-cushions and purses.

16. SHELL—Continued.

b. Shells used for implements, &c.:

(Painters' mussel, (*Unio pictorum*,) used to hold colors.)

(Shells of *Placuna placenta*, used in China as a substitute for window-glass.)

Shells of *Mercenaria violacea*, *Purpura lapillus*, and *Buccinum undatum*, used by Indians of eastern coast in manufacture of money, with specimens of wampum, (with the modern wampum or shell-beads manufactured for the Indian trade,) and of the hyqua or *Dentalium* shells, employed in a similar manner by the Indians of the Pacific coast.

Specimens of the cowry, (*Cypraea moneta*.) "Live cowry" and dead cowry, used in African trade and for trimmings.

Shells of *Cypraea*, *Rotella*, *Oliva*, *Turritella*, *Phasianella*, (Venetian shells,) &c., mounted as buttons and jewelry.

Composition shell-work for box-covers and frames, made by glueing shells in mosaics.

Calcined shells, used by dentifrice and porcelain makers. (See, also, under 32.)

Cuttle-fish bone from *Sepia officinalis*, used as a pounce, as a dentifrice, as polishing-powders, for taking fine impressions in counterfeiting, and as food for birds. (See, also, under D. 5.)

Concretions from the stomach of *Astacus*; known as "crab's-eyes" and "crab-stones," and used as antacids.

Shell of king-crab, (*Limulus polyphemus*,) used as a boat-bailer.

Opercula of mollusks, used as "eye-stones."

17. CORAL.

a. Coral as a material:

Red coral, (*Corallium nobilis*,) with specimens of the five commercial grades (1, froth of blood; 2, flower of blood; 3, 4, 5, blood of first, second, and third qualities) of the white variety, and of the round beads, negligée beads, bracelets, pins, coronets, armlets, and earrings, &c.

White coral, *Oculina*, sp., used by jewelers.

Madrepores and other showy corals, used for ornamental purposes.

Horny axis of black flexible coral, (*Plexaura crassa*,) used for canes and whips in the Bermudas.

17. CORAL—Continued.

a. Coral as a material :

Axis of fan coral, (*Rhipidogorgia*,) used for skimmers and strainers in the Bermudas.

Coral, used for building purposes.

Coral rock of recent formation, (Coquina,) used in Florida in manufacture of ornamental vases and carvings.

Calcined coral, used for dentifrices, as an antacid, &c.

Imitations of red coral in celluloid, rubber, and other substances.

18. INFUSORIAL EARTHS.

a. Polishing powders, (used for polishing metals, cabinet-ware, and stone :)

Specimens of polishing-slate, tripoli, and other foreign polishing-powder.

Specimens of American infusorial deposits.

b. Infusorial earths, employed in manufactures :

Infusorial earth, used in making window and plate glass.

Infusorial earth, used in making soluble glass.

Infusorial earth, used in making mortar.

Infusorial earth, used in making molds for metal casting.

Infusorial earth, used in making filters.

Infusorial earth, used in making dynamite.

Infusorial earth, used in making fire-proof packing.

Infusorial earth, as an absorbent for oils and liquids.

19. OTHER MATERIALS FROM INVERTEBRATES.

a. From insects :

Brazilian diamond-beetles, used in jewelry.

Wings of beetles, used in embroidery.

b. From echinoderms :

Spines of echinoids, used for slate-crayons.

**** Flexible materials.**

20. LEATHERS. (Embracing the hides in a rough state, in the various stages of dressing, and manufactured into shoe-leather, parchment, vellum, binder's leather, thongs, &c.)

a. Prepared from mammal skins :

Cat-leather.

Dog and wolf leather, used for drum-heads, &c.

20. LEATHERS—Continued.

a. Prepared from mammal skins:

Bear-leather.

Raccoon-leather, used for gloves and upper-leathers of shoes.

Seal-leather, used for fine shoes and in the manufacture of "patent leather," and by Eskimos for numerous purposes.

Sea-lion leather, used by Eskimos to cover bidarkas and for garments and beds.

Walrus-leather, used by Eskimos for harness, tables, thongs, seal-nets and for covering polishing wheels.

Bison-leather (and buffalo-leather, buff-leather.)

Ox-leather, with specimens of sole-leather, split-leather, grain-leather, rawhide thongs, whips, leather-belts and saddles, and of calf-skins, prepared for binders' and boot-makers' use, as Russia leather and vellum, and tawed, as parchment.

Sheep-leather, with specimens of binder's leather, imitation chamois leather, wash-leather, buff-leather, roan, imitation morocco and parchment, with vellum made from skins of dead-born lambs, and manufactured gloves, &c.

Goat-leather, with specimens of shagreen-leather, morocco-leather, as used for linings, upholstery, bindings, and pocket-books, parchment, drum-heads, &c., with kid-leather, used in manufacture of shoes and gloves, under-clothing, and vellum made from skin of young kids, also skin-bottles used in Asia.

Horse and ass leather, used in manufacture of shagreen, sole-leather, harness-leather, saddles, trunks, water-hose, pump-valves, military accoutrements, ladies' shoe-uppers.

(Chamois leather, (*Capella rupicapra*,) used for polishing purposes and for straining mercury.)

(Leather of gazelle, (*Gazella dorcas*,) used in packing commercial aloes, and of African antelopes, used in packing elephants' tusks.)

Deer-leather, dressed as buff-leather, chamois-imitation leather, Indian dressed (buckskin,) and for the finer moroccas, also manufactured into gloves, gaiters, undergarments, polishers, &c.

Moose-leather in ordinary and buckskin finish.

20. LEATHERS—Continued.

a. Prepared from mammal skins:

Caribou-leather in ordinary and buckskin finish.

(Reindeer-leather.)

Elk-leather in ordinary and buckskin finish.

Antelope-leather in plain, buckskin, and oil-finish, used in manufacture of castor-gloves.

Peccary-leather as used in the manufacture of gloves.

Hog-leather used by saddlers, shoemakers, and book-binders.

Hippopotamus-leather used for buffing or polishing wheels.

Rhinoceros-hide used for shields, targets, whips, &c.

Beluga-leather dressed as kid, sole, harness, velvet, plush, boot, mail-bags, belts, and patent (varnished) leather.

Porpoise-leather.

Beaver-leather used in manufacture of saddles, shoes, gloves, and trunks.

(Nutria-leather (*Myopotamus coypus*) of South America.)

Rat-leather used for thumbs of kid gloves.

(Kangaroo-leather.)

Leather trimmings used as stuffing for balls, &c.

b. Prepared from intestines of mammals:

Parchment from viscera of seals, used by Eskimo for clothing, bags, and blankets.

Leather from pharynx of seal and walrus used by Eskimo for boot-soles.

Parchment from viscera of bears used in Kamtchatka for masks and window-panes.

Viscera of ox used in manufacture of gold-beaters' skin.

Bladders of animals used for pouches, parchment, bottle and jar covers, and by Eskimo for oil-bottles.

Viscera of sheep used in manufacture of "cat-gut," with specimens of whip-cord, hatters' cord, for bowstrings, clock-makers' cord, filandre, guitar, violin, and harp strings, angling-lines, &c.

Viscera of hog used as envelopes for minced meat, sausages, &c.

Sinews of sheep, deer, goat, buffalo, seal, walrus, and other animals used in manufactures of threads, lines, nets, and snow-shoes, in strengthening bows, &c., the Babiche of the Eskimos of the northwest coast.

20. LEATHERS—Continued.

c. Prepared from bird-skins: (Eskimos.)

Eider-leather.

Auk-leather.

(Ostrich-leather used by Arabians.)

d. Prepared from reptile skins:

Alligator-leather.

Rattlesnake-leather.

Other snake-leather.

e. Prepared from fish-skins:

Leather prepared from scaled fish by Indians.

Eel-leather, (pigtales, queues, flail-thongs.)

Shark-leather, (shagreen used for coverings and by the Alaska Indians for boot-soles.)

Sturgeon-leather.

(Skins of *Diodon* used in making helmets.)

Stomach membranes of halibut used in Greenland for window-transparencies.

f. Leather waste:

Paper manufactured from waste.

Glue manufactured from waste, (see under 24.)

Prussian blue made from leather waste, (see under 30.)

21. HAIR AND WOOL.

a. Hair used in weaving and felting, (see under 8.)

b. Hair used for wigs and ornament:

Human hair as an article of commerce, with specimens of switches and wigs, and also of the trade imitations of hair in jute, horse-hair, &c.

Goats' wool as employed in manufacture of wigs and perukes.

Horse-hair employed for military accoutrements and for standards, (Turkey.)

Human scalp-locks as Indian trophies.

Scalps of animals as trophies.

c. Hair and bristles used for brushes, (embracing the commercial hair and bristles, assorted and unassorted, and specimens of the manufactured articles:)

Hair of skunk used for fine brushes.

Hair of bear used for varnishing-brushes.

21. HAIR AND WOOL—Continued.

c. Hair and bristles used for brushes :

Hair of American badger used for fine shaving, graining, gilding, and dust brushes.

(Hair of European badger used for coarse brushes.)

Hair of dog used for coarse pencil-brushes.

Hair of squirrel, marten, sable, kolinsky, and weasel, especially the tails, used in making fine artists' pencils.

(Hair of camel used for pencils.)

Bristles of hog and peccary used in making coarse brushes for varnishing, scrubbing, &c.

Tails of horses, buffaloes, &c., used for fly-brushes.

(Tails of yak used for fly-brushes.)

(Tails of elephants used for brushes and standards.)

Sheep's wool (on skin) used for black-board rubbers.

Hair of deer and antelope (on skin) used by Indians for hair-brushes.

Ox-hair from the inside of cows' ears used for striping and lettering brushes.

d. Hair used in other manufactures :

Bristles used in shoemakers' waxed ends.

Bristles used in anatomical instruments.

Hair and bristles used in artificial flies. (See under B, 45.)

Hair of cattle used in strengthening mortar and plaster.

e. Hair used for stuffing :

Horse-hair, straight and curled, used for mattresses and cushions.

Refuse hair of beaver and musquash, cut from felting-hair, used for cushions.

(Down of rabbits used for cushions.)

f. Wool used as a medium for pigments :

Wool flocking used in the manufacture of wall-paper, colored felts, and rubber-cloth.

g. Chemical products :

Refuse human and other hair used in manufacture of prussiate of potash, with specimens of manufactured product.

22. QUILLS.

a. Quills of mammals :

Quills of American hedge-hog used by Indians in embroidering.

22. QUILLS—Continued.

a. Quills of mammals:

(Quills of porcupine used for pen-holders, floats for fishing, eyelet-punches, &c.)

(Quills of European hedge-hog, on skin, used as a muzzle for weaning calves.)

b. Quills of birds:

Quills of swan and turkey for engrossing-pens.

Quills of goose and eagle for writing-pens.

Quills of crow and duck for fine pens.

Quills used in making toothpicks, fishing-floats, color-bottles, pencil-handles, needle-holders, &c.

23. FEATHERS.

a. Feathers used for clothing. (See under Furs, D 6.)*b.* Feathers used for implements, (including manufactured articles:)

Feathers of hawks used as fans and screens.

Feathers of fowl, turkey, grouse, and peacock used for brushes, fans, and screens.

Feathers of ibis, spoonbill, egret, and bittern used for fans and screens.

Feathers of flamingoes, swans, geese, and ducks used for fans and screens.

c. Feathers used for plumes and ornament, (including plumes, head-dresses, cockades, hat and dress trimming, &c.):)

Feathers and wings of small perchers used in millinery and in manufacture of feather flowers.

Feathers of trogons and birds of paradise used as plumes and for feather flowers.

Feathers of humming-birds, scalps, and throats used in ornamental work.

Feathers of kingfishers used in plumagery.

(Feathers of parrots used in making feather flowers.)

Eagle and hawk feathers used for plumes.

Feathers of pigeons used for ornamental work.

Feathers and wings of cock used as plumes, trimmings, &c., natural and dyed.

Breast feathers of grouse, pheasants, and turkeys used as roll-plumes in hats.

23. FEATHERS—Continued.

c. Feathers used for plumes, &c.:

Feathers of ibises, spoonbills, flamingoes, herons, egrets, and bitterns used for plumes and ornamental work.

(Feathers of adjutant, (*Lepoptilus argala*), and marabou, (*Lepoptilus marabou*), used for plumes and trimmings.)

Feathers of flamingoes, swans, geese, and ducks used in ornamental work for roll-plumes, and swans' down for trimmings. (See under 6.)

Breast-feathers of gulls, terns, and tropic birds used as roll-plumes.

(Feathers of African ostrich used for plumes and trimmings, with specimens of undressed, scoured, bleached, scraped, and dyed grades.)

Feathers of American ostrich.

Specimens of composite feather flowers.

Specimens of plumagery work on metal.

Specimens of birds mounted for use in millinery.

d. Feathers used in other manufactures:

Feathered arrow-shafts. (See under B, 18.)

Feathers used in making artificial flies. (See under B, 45.)

Feathers used in manufacture of textile fabrics. (See under D, II, C.)

e. Down of birds:

Down of eider-duck used in bed-stuffing, with specimens of the balls in which it is packed for transportation.

Down of other ducks.

Down of geese and swans used as stuffing for beds, and as electrical non-conductor in manufacture of philosophical instruments.

24. GELATINE AND ISINGLASS.

a. Gelatine:

Gelatine made from leather-shavings, bones, hoofs, and horns of bison, cattle, sheep, and other domestic animals, used in manufacture of glue, size, court-plaster, *papier glacé* for tracing, imitation glass, artificial flowers, and ornamental work, wrappings for confections, table-jelly, (see under D. 1,) &c.

Size and gelatine from fine ivory chips.

24. GELATINE AND ISINGLASS—Continued.

a. Gelatine:

Bone-glue, (Osteocolla.)

(Glue made in India from skin of the ass, (Hippocolla.))

b. Isinglass:

Isinglass, (Ichthyocolla,) made from air-bladders and skins of fishes and used in the manufacture of fine glues and sizes, adhesive and court plasters, diamond cement, imitation glass, and table-jelly and confectionery, (see under D. 1, D,) in refining wines and liquors, in adulterating milk, in fixing the luster of artificial pearls, and in lustering silk ribbons, (embracing the dried bladders and the manufactured products,) in their grades of "lyre," "heart-shaped," "leaf," and "book" isinglass.

Isinglass from sounds of cod and hake.

Isinglass from the squeteague family, (*Sciaenidae*,) principally used by confectioners.

Isinglass from cat-fish family, (*Siluridae*.)

Isinglass from carp family, (*Cyprinidae*.)

Isinglass from sturgeons in all its grades and commercial forms.

Isinglass prepared from fish-skins.

25. FLEXIBLE MATERIALS DERIVED FROM INVERTEBRATES.

a. Insect productions:

Silk-worm "gut" used in making leaders for fish-lines.

(Nest of Cayenne-ant, (*Formica bispinosa*,) used as a mechanical styptic.)

Spiders' web used as a mechanical styptic and for the cross-lines in optical instruments, (see, also, under D, 8.)

Papier-maché of hornets' nests used for gun-wadding.

b. Mollusk productions:

Byssus of mollusks, (see under D, 8.)

26. SPONGES.

a. Specimens of American commercial sponges, with the different grades, and bleached sponges:

(Specimens of Mediterranean sponges.)

Surgical apparatus, probangs, aurilaves, "sponge-tents," and other instruments manufactured.

Spongeo-piline used as a substitute for poultices.

Sponges used in stuffing mattresses and cushions.

27. OILS AND FATS.

a. Mammal oils :

Bear-oil and bear-fat used as a cosmetic and in the manufacture of pomatums.

Dog-oil used in the manufacture of kid-gloves.

Seal-oil, in its various grades, used for lubricating.

Sea-elephant oil.

Sea-lion oil.

Manatee-oil.

Dugong-oil.

Oil and fat from domestic animals, tallow, suet, lard, lard-oil used in lamps, for lubricating, and neats-foot oil used in dressing leather, also manufactured into various substances, (see D, 30,) and tallow candles and night-lights.

Oil from body of whales, grampuses, and porpoises used in the arts, for lubricating, painting, &c.

Black-fish and porpoise-jaw oil used in lubricating fine machinery, watches, clocks, and guns, with specimens of blubber.

Grampus-oil used for lubricating fine machinery.

Sperm-oil used in lamps, for lubricating, as an emollient in medicine, for lip-salves, and in the manufacture of spermaceti.

Manufactured glycerines, used as a preservative and antiseptic, as a cosmetic, as an emollient, as a substitute for cod-liver oil, in the manufacture of perfumes and hair-dressings, in photography, in the manufacture of nitroglycerine, dynamite, dualine, lithofracteur, coloniamite, and other explosives, soap, &c.

Manufactured stearines, with candles and other manufactured articles.

Soaps manufactured from mammal-oil, soda-soaps, (hard, toilet, and resin soaps,) potash-soaps, (washing, shaving, and soft soaps,) diachylon plaster, &c.

Spermaceti, with specimens of candles.

Butter made from milk of cows, goats, and horses.

Oleomargarines, with specimens of imitation butter.

Brains of buffalo used in tanning by Indians.

b. Bird-oils:

(Oils of petrels and other sea-birds used by Eskimos and in the Azores for lamp-oil.)

27. OILS AND FATS—Continued.

b. Bird-oils :

Goose-oil used by watch-makers, and as an emollient.

(Oil of guacharo, (*Steatornis caripensis*,) used in South America as food.)

(Ostrich used for food, and by the Arabs in medicine, and emu-oil used in Australia in medicine.)

(Oil of penguin, (*Diomedea chilensis*,) of Falkland Islands, sold in London for currying leather.)

(Peacock's fat and oil.)

(Oil of mutton-bird, (*Procellaria obscura*,) of Bass's Straits, used for lamp-oil illuminating.)

(Oil of frigate-bird, (*Tachypetes aquila*,) sometimes used in medicine.)

Oil of pigeon, (*Ectopistes migratorius*,) used as food by Indians and frontiersmen.

(Fulmar-oil from island of Saint Kilda.)

c. Reptile oils :

Alligator-oil manufactured in Florida.

(Alligator-oil used by South American Indians, mixed with cheica pigment for painting their bodies.)

Turtle-oil made from turtle-eggs, used in dressing leather and in manufacture of soap.

Rattlesnake and other snake oils.

d. Fish-oils :

Sun-fish oil used by fishermen for cure of rheumatism.

Cod-oil, also cod-liver oil used in medicine, as a food and emollient, and in lubricating.

Hake and haddock liver oil used in adulterating cod-liver oil.

(Pollock-oil used by Shetlanders for illumination.)

Menhaden-oil used in currying leather, in rope making, for lubricating, for adulterating linseed-oil, as a paint-oil, and exported to Europe for use in the manufacture of soap and for smearing sheep.

Herring-oil.¹

White-fish oil.¹

Sturgeon-oil.¹

(¹NOTE.—These oils, with other oils made from fishes, and a large part of the seal and "black" whale oil, are known indiscriminately as fish-oil and used chiefly for the purposes enumerated under the head of menhaden-oil.)

27. OILS AND FATS—Continued.

d. Fish-oils:

Oulaachan oil used by Indians of Northwest coast for food and illumination.

Shark and skate liver oil, including the "Rouen oil," made on the coast of Normandy from the livers of *Raia aquila*, *R. pastinaca*, and *R. batis*, used like cod-liver oil.

Cramp-fish oil used by fishermen for cure of rheumatism.

Soaps made from fish-oil.

28. PERFUMES.

a. Mammal perfumes:

(Civet of the civet-cat (*Viverra civetta*) of Africa.)

(Civet of the rasse (*Viverra rasse*) of Java.)

(Zibeth civet of the Zibeth (*Viverra zibetha*) of Indian Archipelago.)

(Musk from musk-deer, (*Tragulus*, sp. var.,) in its various grades, of Tonquin or Thibet, and Kabardin, Russian, or Siberian musk.)

Musk of musk-ox.

Musk of the musquash.

Castoreum of the beaver, including the various commercial grades, the Canadian, Hudson's Bay, and Russian castoreum, and specimens of castorine.

(Hyraceum of the daman, (*Hyrax capensis*.))

Ambergris of sperm-whale, with specimens of ambreine.

b. Reptile perfumes:

Musk of alligator.

Oil of hawksbill and loggerhead turtles, used in perfumery.

29. COLORING MATERIALS.

a. Derived from mammals:

Bone-black.

Ivory-black, (*noire d'ivoire*,) used in fine painting, and in the manufacture of bank-note ink.

Prussiates, prussian-blue, ferrocyanide of potassium, made from hoofs and refuse human and other hair.

Gall of animals used in dyeing.

Dung of animals used in calico-printing.

Hæmatin made from blood, and used in turkey-red dye-works, and for the red liquor of printers.

Wool-flocking. (See under D, 21.)

29. COLORING MATERIALS—Continued.

b. Derived from birds :

Shell of eggs, used for white pigment.

Series of murexides, or purpurate of ammonia dyes, made from guano.

c. Derived from fishes :

(*Essence d'Orient*, or fish-scale pearl, used as a pigment.)

(Gall of carp, used in Turkey as a green paint and in staining paper.)

d. Derived from insects:

(Cochineal dye, from *Coccus cacti* of Mexico, used in manufacture of rouge, of carmine, and lake pigments, and in coloring tinctures.)

Canadian cochineal.

(Kermes (and other cochineals of commerce, *Coccus ilicis*.)

(Lac dye and lac lake, from *Coccus lacca*, *C. polonicus*, *C. ura ursi*, and *Ophis fabæ*.)

Dye prepared from bed-bug, (*Cimex lectularius*.)

(Dye prepared from *Trombidium*, in Guinea and Surinam.)

Nut-galls produced by insects, and used in tanning, for black dyes, for woolen cloth, silk, and calico, and in manufacture of ink and gallic and pyrogallic acid, employed in photography.

e. Derived from mollusks :

(*Sepia* from *Sepia officinalis*.)

Purple dyes from gastropods, *Murex*, *Purpura*, &c.

Purple dyes from nudibranch mollusks.

30. CHEMICAL PRODUCTS AND AGENTS EMPLOYED IN ARTS AND MEDICINE.

a. Derived from mammals :

Secretion of skunk.

Album græcum of dogs, used as a depilatory in tanning hides.

Albumen of blood, employed in sugar-refineries, in certain cements and pigments, and as antidote and emollient.

Dung, used in calico-printing.

Gall of animals, used in mixing colors, in fixing the lines of crayon and pencil drawings, in preparing the surface of ivory for painting, in removing grease, and in medicine.

Pepsine and pancreatine, prepared from stomachs of hogs and calves.

30. CHEMICAL PRODUCTS, &c.—Continued.

a. Derived from mammals:

(Koumiss, a fermented liquor, prepared from mare's and cow's milk, and employed in medicine.)

Phosphorus, prepared from bones, with specimens of matches, vermin poisons, and other products.

Vaccine lymph, derived from cows.

Ammonia, prepared from bones and horn.

Sal ammoniac, prepared from bones and dung.

Prussiates, prepared from hoof, horn, and leather waste, dried blood, hair, and wool, with specimens of blue cyanide of potassium.

Lime from bones and bone phosphates. See also under 32.

Punk and tinder, made from droppings of camel and bison.

Animal charcoal, used as a decolorizer.

b. Derived from birds:

Albumen of eggs, used in photography, in clarifying liquors, by physicians as emollients and antidotes, and by apothecaries in suspending oils and other liquids in water.

Egg-shells, employed as an antacid.

c. Derived from reptiles:

Crotalin of rattlesnake and copperhead.

(*Scincus officinalis* of Egypt, used by European practitioners as sudorific and stimulant.)

d. Derived from fishes:

Propylamine, made from fish-brine.

(Intestines of grayling, used by Laplanders as a substitute for rennet.)

Skins of eels, used by negroes for rheumatism.

e. Derived from insects:

Vesicatory preparations from American beetles, *Cantharis cinerea* and *C. vittata*.

(Vesicatory preparations derived from foreign beetles, cantharides or Spanish flies, (*Cantharis vesicatoria*,) and other species, and substitutes *Mylabris eichorii*, *Cercoma Schoefferi*, *Meloe*, sp. var., &c.)

Vesicatory preparations from American spiders, such as *Tegenaria medicinalis*.

Gall-nuts, used in medicine. (See under 29.)

30. CHEMICAL PRODUCTS, &c.—Continued.

e. Derived from insects:

Coccinella, used as a remedy for toothache.

(Trehala, made from nests of beetles, (*Larinas nidificans*,) of East Indies, and used as a substitute for tapioca.)

Formic acid.

Carbazotic acid and its derivatives, made from sewing silk scraps, and used as a substitute for quinine.

Beeswax, used in manufacture of candles, cerates, plasters, and artificial flowers, in modeling and casting, and in medicine.

Honey, used as a preservative, a food, and in medicine as an aperient and demulcent.

(Wax, used in Chinese pharmacy, secreted by the *Coccus pchlah*.)

(Manna, produced by punctures of *Coccus manniparus*.

a'. Manna from the *Tamarix mannifera*, used as food, and in medicine as a purgative.

b. Cedar manna of Mount Lebanon, from *Pinus cedrus*.

c. Arabiau manna, from *Hedysarum alliagi*.)

(Eye-powder, made by Chinese from the Telini fly, (*Mylabris cichorii*,) of India.)

f. Derived from crustacea:

Salve-bug of fishermen of Banks, (*Caligus curtus*,) parasite on cod-fish.

Crabs' eyes, or concretions from stomach of astacus, used as an antacid.

g. Derived from worms:

American leech, (*Macrobella decora*,) used in surgery.

(European leech, (*Hirudo medicinalis*,) introduced into America.)

(African leech, (*Hirudo trochina*,) introduced.)

Leeches used as barometers.

h. Derived from mollusks:

(Cuttle-fish bone of *Sepia officinalis*.) (See under D, III, H.)

Calcined shells, used for building-lime, and in manufacture of dentifrices and enamel. (See under III, H.)

i. Derived from radiates:

a. Limes, derived from calcining coral and coral rock.

30. CHEMICAL PRODUCTS, &c —Continued.

k. Derived from protozoans:

Burnt sponge, formerly used in medicine.

Infusorial earth, and its applications. (See above, under *K.*)

31. FERTILIZERS.

a. Natural guanos:

Bat guano from caves.

Bird guano from oceanic islands.

b. Artificial guanos:

Menhaden guano.

Herring guano.

White-fish guano.

Other fish guano.

c. Artificial fertilizers:

Bone-dust ground for use.

Bone phosphates.

Dried meat from refuse of slaughter-houses.

Poudrettes.

Other animal fertilizers.

32. LIMES. (See under 30.)

33. OTHER MATERIALS NOT MENTIONED.

SECTION E.

PROTECTION AND CULTURE.

I. INVESTIGATION.

1. METHODS OF THE UNITED STATES FISH COMMISSION.

a. Methods of work :

Apparatus for collecting specimens, (see under B.)

Apparatus for physical research.

Appliances for working up results.

(This should include a model of coast laboratory with all its fittings.)

b. Results of work :

Publications of the commission.

Collections, (see under A, V to VIII.)

Photographs, &c.

II. PROTECTION.

2. PRESERVATION OF GAME, FISH, &c. :

** From man.*

a. Game laws.

*** From artificial obstructions.*

b. Fish-ways :¹

Gap fish-ways.

Trench, ditch, or "Cape Cod" fish-ways.

Oblique grove fish-ways :

Single groove.

Brewer's.

Mather's.

Step fish-ways :

Box or pool fish-ways :

Overflowing, (old style.)

With passage-way cut down to the floor, (Smith's.)

With passage-way submerged, (Cail's.)

With contracting galleries, (Pike's.)

With transverse-sloping floors, (Steck's.)

2. PRESERVATION OF GAME, FISH, &c.—Continued.

b. Fish-ways:

Steps contrived by arrangement of rocks and bowlders.

Inclined plane without steps:

Plain, (Pennsylvania.)

With partitions at right angles:

“Rectangular compartment.”

Brackett’s.

With oblique partitions:

Foster’s.

Swazey’s.

*** *From natural enemies.*

c. Apparatus for destroying injurious species:

Oyster-bed tangles, (see under B, 12.)

3. CARE OF ANIMALS IN CAPTIVITY.

a. Tethers and hobbles.*b.* Cages and pens:

Kennels for dogs, &c.

Cages for animals.

Cages for birds.

Cages for insects.

(West India fire-fly trap.)

c. Fish-cars and other floating-cages for aquatic animals.*d.* Aquaria:

Globes.

Aquaria.

e. Hives and other cages for insects.*f.* Live-boxes, troughs, &c., for microscopists’ use.*g.* Fish-ponds, fish-farms, (models.)

4. ENEMIES OF USEFUL ANIMALS.

a. Intestinal worms and other internal parasites.*b.* Fish-lice, barnacles, and other external parasites.*c.* Predatory animals not elsewhere exhibited.

III. PROPAGATION.

5. PROPAGATION OF MAMMALS.

a. Methods of mink culture.*b.* Methods of culture of domesticated animals.

6. PROPAGATION OF BIRDS.

a. Methods of ostrich culture.

b. Methods of culture of domesticated birds, fowls, &c.

7. PROPAGATION OF REPTILES.

a. Methods of terrapin culture.

8. PROPAGATION OF AMPHIBIANS.

a. Methods of frog culture.

9. PROPAGATION AND CULTURE OF FISHES.¹

a. Accessories of obtaining and impregnating ova :

Pans, pails, &c.

Strait-jackets used in spawning salmon.

Spawning-race, (Ainsworth.)

Roller-spawning screen, (Collins.)

Spawning-vat, (Boud.)

b. Hatching-apparatus :

Troughs :

Plain.

Gravel-bottomed.

With sieve-bottom trays :

Brackett's.

Williamson's.

Clark's.

Vats or cases :

Holton's.

Roth's.

Glass-grilled boxes, (Coste's.)

Jars and tin-vessels :

Bell and Mather's.

M. A. Green's.

Ferguson's.

Chase's.

Hatching-boxes, (floating :) :

Seth Green's shad-box.

Brackett's shad-box.

Brackett's shad-box, (No. 2.)

Bryant's shad-box.

Stilwell & Atkins's shad-box.

Bannister's shad-box.

¹ Classification proposed by J. W. Milner.

9. PROPAGATION AND CULTURE OF FISHES—Continued.

b. Hatching-apparatus :

Hatching-boxes, (floating :)

Adhesive eggs apparatus :

Vertical wire-cloth trays.

Hatching-basket.

Brook shanty, (Furman's.)

(Bay or cove barriers, Professor Rasch's.)

Accessories :

Tanks.

Nests.

Trays.

Grilles.

Gravel-filters.

Flannel screens.

Shallow troughs or tables (for picking eggs.)

Egg-nippers.

Cribbles.

Pipettes.

Skimmer-nets.

Feathering quills and brushes.

Rose-nozzles, (for washing eggs.)

Syringes, bulb, &c.

Shallow pans.

Aerating-pipe.

c. Transporting apparatus :

Apparatus for transporting eggs :

Cans.

Case of cups, (Wilmot's.)

Case of cups, (Clark's.)

Case of trays, (Clark's.)

Moss-crates, (Stone's.)

Apparatus for transporting fish :

Barrels.

Cans, plain.

Cans with aerating accessories :

Slack's.

Clark's.

Creveling.

M. A. Green's.

9. PROPAGATION AND CULTURE OF FISHES—Continued.**c. Transporting apparatus :**

Apparatus for transporting fish :

Tanks with aerating accessories :

Tanks, with attachment of band-wheel to car-axle,
(Stone's.)

(Tanks, with Freiburg aerating apparatus.)

Aquarium-car, (Stone's.)

Live-box, (Atkins's.)

Accessories :

Air force-pumps.

Siphons.

Siphon-tubes.

Bellows.

Roses, aerating.

10. PROPAGATION OF INSECTS.**a. Propagation of silk-worm :**

Specimens of plants used for food.

Model of house and its appliances.

b. Propagation of cochineal insect.**c. Propagation of bees :**

For hives, (see under E. 3.)

11. PROPAGATION OF WORMS.**a. Propagation of leeches.****12. PROPAGATION OF MOLLUSKS.****a. Methods of oyster culture :**

Stools for receiving spat, natural and artificial.

Other apparatus.

13. PROPAGATION OF CORALS.**14. PROPAGATION OF SPONGES.**

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Department of the Interior:

U. S. NATIONAL MUSEUM.

— 7 —

BULLETIN

OF THE

UNITED STATES NATIONAL MUSEUM.

No. 7.

PUBLISHED UNDER THE DIRECTION OF THE SMITHSONIAN INSTITUTION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1877.

ADVERTISEMENT.

This work is the seventh of a series of papers intended to illustrate the collections of natural history and ethnology belonging to the United States and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

JOSEPH HENRY,

Secretary of the Smithsonian Institution.

SMITHSONIAN INSTITUTION,

Washington, April, 1877.

CONTRIBUTIONS
TO THE
NATURAL HISTORY

OF THE
HAWAIIAN AND FANNING ISLANDS

AND
LOWER CALIFORNIA,

MADE IN CONNECTION WITH THE UNITED STATES NORTH PACIFIC
SURVEYING EXPEDITION, 1873-75.

BY
THOS. H. STREETS, M. D.,
PASSED ASSISTANT SURGEON, U. S. NAVY.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1877.

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P R E F A C E.

The collections that furnished material for this bulletin* were made, one in 1873-74, by Surgeon William H. Jones, U. S. N., and the writer, while serving on board the United States ship *Portsmouth*, Commander Joseph S. Skerrett commanding, engaged in the survey of the islands of the North Pacific Ocean; and the other by the writer alone, in 1874-75, while on board the United States steamer *Narragansett*, Commander George Dewey commanding, engaged in the survey of the coasts of the peninsula of Lower California.

The first collection very well represents the fish-fauna of the harbor of Honolulu and the avi-fauna of the Fanning group. While among the latter islands, our means for the preservation of specimens were too limited to permit of a very extensive collection of fish. A complete botanical collection was made at Palmyra and Christmas Islands. The plants were sent home from the Pacific; and before I arrived there to commence the work of arranging the collection, they had been identified by Prof. A. Gray, and distributed through the general collection of the Agricultural Department at Washington, so that it was impossible to get a list of them except by overhauling the entire collection. The present list, therefore, represents little more than the duplicate series. I am indebted to Prof. Gray and Dr. Vasey, Botanist of the Agricultural Department, for the notes accompanying the list of plants from Lower California.

The Fanning group, with the exception of the Hawaiian, were the only islands visited in the Pacific. This group comprises the islands of Christmas, Fanning, Washington, and Palmyra. They are situated immediately north of the equator from latitude $1^{\circ} 57'$ to $5^{\circ} 49'$, and extend from longitude $157^{\circ} 27'$ W. to $162^{\circ} 11'$ W. Palmyra is the most northern and western, and Christmas the most southern and eastern of the group. From these two came the largest part of our collection. They are uninhabited, save by parties that go there to harvest the crop

* Excepting the Crustaceans, the invertebrate portion of the collection is excluded from this bulletin.

of cocoanuts. They are exclusively coral formations; and all except Christmas are well clothed with vegetation, and are frequently visited by rains.

In regard to the Lower Californian collection, it by no means represents either the fauna or flora of any place or section. The specimens were collected all along the coasts—our stay at any one place being too short to admit of more than a mere cursory examination of its life.

I regret to say that a large collection of birds' eggs from Palmyra and Christmas Islands was completely destroyed by rats on board the ship.

To Dr. Elliott Cones, U. S. A., belongs the credit of the identification of the birds, and he has very kindly furnished me with the notes accompanying that portion of the ornithological collection from the Californian peninsula. I desire to express, in this connection, my obligations to Prof. T. Gill for assistance in the classification of the fishes, and for his advice in other matters relating to my ichthyological work. To both these eminent gentlemen I tender my sincere thanks.

T. H. S.

SMITHSONIAN INSTITUTION,

Washington, D. C., April, 1877.

ORNITHOLOGY.

SYLVICOLIDÆ.

DENDRÆCA AUDUBONI, (Towns.) Bd. [No. 70632].

Sylvia audubonii, Towns., Jour. Acad. Nat. Sci. Phila., vii, 1837, 190.

Sylvicola audubonii, Bp., List, 1838, 21.—AUD., B. Am., ii, 1841, pl. 77.

Dendræca audubonii, Bd., B. N. A., 1858, 273.—COUES, Key, 1872, 100; Birds Northwest, 1874, 58.—Bd., BREW., & RIDG., N. A. Birds, i, 1874, 229, pl. xiii, f. 1.

Locality: mouth of the Colorado River. Immature plumage; throat scarcely tinged with yellow. One specimen.

FRINGILLIDÆ

PASSERCULUS SAVANNA ALAUDINUS, (Bp.) [No. 70633].

Passerculus alaudinus, Bp., Comp. Rend., xxxvii, 1853, 918.—Bd., Birds N. A., 1858, 446.

Passerculus savanna alaudinus, Bd., BREW., & RIDG., N. A. Birds, i, 1874, 537, pl. xxiv, f. 11.—HENSCHAW, Wheeler's Exped., vol. v, 1875, Zool., 254.

Passerculus savanna, ALLEN, Bull. Mus. Comp. Zool., 1872, 177.—COUES, Birds North. west, 1874, 127 (in part).

Locality: San Ignacio River, Sonora, Mexico. One specimen. Flew aboard the ship while at anchor, and was captured.

PASSERCULUS SAVANNA ANTHINUS, (Bp.) Cs. [No. 70634].

Passerculus anthinus, Bp., Comp. Rend., xxxvii, 1853, 919.

Passerculus savanna anthinus, COUES, Key, 1872, 136.—Bd., BREW., & RIDG., N. A. Birds, i, 1874, 539, pl. xxiv, f. 10.—COUES, Birds Northwest, 1874, 128.

Locality: Todos Santos Islands, Pacific coast of Lower California. One specimen.

PASSERCULUS ROSTRATUS, (Cass.) Bd. [No. 70635].

Emberiza rostrata, CASSIN, Proc. Acad. Nat. Sci. Phila., vi, 1852, 348.

Ammodramus rostratus, CASSIN, Ill. B. Cal. Tex., &c., i, 1855, 226, pl. 38.

Passerculus rostratus, BAIRD, Birds N. Am., 1858, 446.—Bd., BREW., & RIDG., N. A. Birds, i, 1874, 542, pl. 24, f. 12.—COUES, Key, 1872, 136.

Locality: Todos Santos Islands. One specimen. Inseparable from typical *rostratus* of Southern and Lower California (mainland), though

rather larger (wing 2.80, instead of about 2.50; tail 2.10, instead of about 1.90). The peculiar turgid shape of the bill and its light-brown color, together with the special light reddish-brown tone of all the markings of *rostratus*, are repeated with fidelity.

PASSERCULUS GUTTATUS, *Lawr.* [Nos. 70636, 70637].

Passerculus guttatus, LAWRENCE, ANN. LYE. New York, viii, 1867, 473.

Passerculus rostratus var. *guttatus*, B., B., & R., N. A. Birds, i, 1874, 544.

Resembling *P. rostratus* in the great size of the bill, but with that member of a decidedly different shape. In *P. rostratus*, the shape of the bill is peculiar in the genus, and very much resembles that of a *Pyrranga* in its turgidity, the convexity of the culmen throughout, and other features. In *P. guttatus*, the shape of the bill is as in the *Passerculi* generally, but its size is relatively greater. Culmen 0.50 of an inch long, about straight; depth of bill at base 0.22–0.30. Most or all of the upper mandible black; the lower yellowish, with dusky point. System of coloration as in other *Passerculi*; the loreal line only just appreciably tinged with yellowish; yellow of bend of wing obsolete. General coloration much as in *P. savanna*. Length, as well as can be judged, about 5.75 inches; wing 2.75; tail 2.10; tarsus 0.85; middle toe and claw 0.80; bill as already given.

Two specimens from San Benito Island, Pacific coast of Lower California.

This well-marked form has been referred [Check List, No. 160 a; B., B., & R., i, p. 544] to *P. rostratus* as a geographical or local race. Its relationships seem rather to be with *P. sandvicensis*, however, there being very little difference in color, while there is more resemblance to this species in form than to *P. rostratus*. Upon the whole, we are inclined to consider it a good species. The only other specimen that has been obtained is in the National Museum. It came from San José del Cabo.

SPIZELLA BREWERI, *Cass.* [No. 70638].

Emberiza pallida, AUD., Orn. Biog., v, 1839, 66, pl. 398, f. 2; Birds Am., iii, 1841, 71, pl. 161 (*nce* SWAIN).

Spizella pallida, BONAP., Consp. Av., i, 1850, 480.

Spizella breweri, CASSIN, Proc. Acad. Nat. Sci. Phila., viii, 1856, 40.

Spizella pallida breweri, COUES, Key, 1872, 143; Birds Northwest, 1874, 151.—BD., BREW., & RIDG., N. A. Birds, ii, 1874, 13, pl. 27, f. 4.

Locality: Angel Island, Gulf of California. One specimen.

ZONOTRICHIA LEUCOPHRYS INTERMEDIA, Ridgw. [No. 70639].

Zonotrichia gambeli, Bd., Birds N. A., 1858, 460.

Zonotrichia leucophrys var. *gambeli*, Coues, Key N. A. Birds, 1872, 145 (in part).

Zonotrichia intermedia, YARROW, Rep. Orn. Specs., 1871, Wheeler's Exped., 1874, 35.

Zonotrichia leucophrys var. *intermedia*, RIDGW., MS.—HENSHAW, Wheeler's Geograph. and Geol. Expl. and Surv. West of the 100th Merid., v, 1875, Zool., 261, pl. 7, f. 1, 2.

Locality: Los Coronados Islands, near San Diego, Cal.

CALAMOSPIZA BICOLOR, (Townsend.) Bp. [Nos. 70640, 70641, 70642].

Fringilla bicolor, TOWNSEND, Jour. Acad. Nat. Sci. Phila., vii, 1837, 189.

Calamospiza bicolor, Bp., List, 1833, 30.—Bd., Birds N. Am., 1858, 492.—Coues, Key, 1872, 147; Birds Northwest, 1874, 163.—Bd., Brew., & Ridg., N. A. Birds, ii, 1874, 61, pl. 29, f. 2, 3.

Corydalina bicolor, Aud., Syn., 1839, 130.

Dolichonyx bicolor, Nutt., Man., i (2d ed.), 1840, 203.

Localities: Angel Island and Pichilingue Bay, Gulf of California.
Three specimens.

GONIAPHEA MELANOCEPHALA, (Sw.) Gray [No. 70643].

Guiraca melanocephala, Sw., Philos. Mag., i, 1827, 433.—Bd., Birds N. Am., 1858, 498.

Coccothraustes melanocephalus, Rich., Pr. Brit. Assoc. for 1836 (1837).

Pitylus melanocephalus, Gray, Gen. of Birds, ii, 362.

Fringilla melanocephala, Aud., Orn. Biog., iv, 1838, 519, pl. 373.

Coccothraustes melanocephalus, Aud., Syn., 1839, 133.

Hedymeles melanocephalus, Cab., Mus. Hein., i, 1851, 153.—Bd., Brew., & Ridg., N. A. Birds, ii, 1874, 73, pl. 30, f. 1, 2.

Goniaphea (Hedymeles) melanocephala, Gray, Hand-list, No. 7547.

Goniaphea melanocephala, Coues, Key, 1872, 149; Birds Northwest, 1874, 167.

Fringilla xanthomaschalis, Wagl., Isis, 1831, 525.

Locality: Pichilingue Bay, near La Paz. One specimen.

CORVIDÆ.

CISSILOPHA SANBLASIANA, (Lafre.) Bp. [No. 70644].

Geai de San Blas, NÉBOUX, Rev. Zool., 1840, 290, 323.

Pica sanblasiana, LAFR., Mag. de Zool., 1842, Ois., t. 28.

Cyanocorax de San-Blas, PREV. & DES MURS, Voy. Vénus, v, 200.

Cissilopha sanblasiana, Bp., Consp., i, 380.—LAWRENCE, Mem. Boston Soc. Nat. Hist., ii, 284.

"*Cyanurus gcoffroi*, Bp.," Gray, Hand-list, ii, 4.

Cyanocitta sanblasiana, SCL. & SALV., Proc. Zool. Soc. London, 1876, 269.

Locality: Mita Point, Sinaloa, Mexico. One specimen. Identical

with unquestioned examples of this species, except in the lack of any decided crest, though the feathers of the part are somewhat full. Bill jet-black, and the feet are blackish. In this and various allied jays of the black-bellied section of the genus *Cyanocitta*, it appears that the bill, and even the feet, may be indifferently either yellow or black. The *C. crassirostris* Bp. was separated from *C. beecheyi* partly on account of its black instead of yellow bill, but has, however, other and better specific characters.

TYRANNIDÆ.

TYRANNUS VOCIFERANS, Sw. [No. 70645].

Tyrannus vociferans, Sw., Quart. Jour. Sci., xx, 1823, 273.—Bd., Birds N. Am., 1853, 171.—COUES, Key, 1872, 170, f. 110^d.—Bd., BREW., & RIDG., N. A. Birds, ii, 1874, 327, pl. 43, f. 5.—COUES, Birds Northwest, 1874, 233.

Lophytes vociferans, CAB., Mus. Hein., ii, 1859, 77.

Tyrannus cassini, LAWR., Ann. Lyc. New York, v, 1852, 39, pl. 3, f. 2.

Locality: Bay of Santa Tomas, Pacific coast of Lower California. One specimen.

MYIARCHUS CINERASCENS, (Laur.) ScL. [No. 70646].

Tyrannula cinerascens, LAWR., Ann. Lyc. New York, v, 1851, 169.

Myiarchus cinerascens, SCL., Ibis, 1859, 121.—COUES, Key, 1872, 171; Birds Northwest, 1874, 239.

Myiarchus crinitus cinerascens, Bd., BREW., & RIDG., N. A. Birds, ii, 1874, 327, pl. 43, f. 6.

Myiarchus mexicanus, Bd., Birds N. Am., 1853, 179 (nec KAUP; nec LAWR., Ann. Lyc. New York, ix, 1869, 202).

Myiarchus mexicanus pertinax, Bd., Proc. Acad. Nat. Sci. Phila., 1859, 303.

Locality: Pichilique Bay, Lower California. One specimen of the slightly broader bill form noticed by Baird from Cape San Lucas under the name of var. *pertinax*.

ARIDÆ.

CHRYBOTIS FINSCHI, Sclat. [No. 70647].

Chrysotis finschi, SCLAT., Proc. Zool. Soc., 1864, 298.—FINSCH, Die Papageien, ii, 1868, 543.

Chrysotis viridigenalis var., GRAY, List Psitt., 1859, 82.

Chrysotis viridigenalis, SOUANCE, Icon. Perr., t. 31 (upper fig.) sine descr.

Locality: Mita Point, Sinaloa, Mexico. One specimen. Agreeing perfectly with labeled specimens in the National Museum.

TRICHOGLOSSIDÆ.

CORIPHILUS KUHLI, (*Vigors*) *Wagler* [Nos. 67314, 67358, 67333].

Psittacula kuhli, VIGORS, Zool. Jour., 1824, 412, pl. 16.

Psittacus kuhli, LESS., Voy. Coq., 1828, 629.

Lorius kuhli, LESS., Tr. d'Orn., 193.

Vini coccineus, LESS., Ill. de Zool., 1832, t. 25.

Coriphilus kuhli, WAGLER, Mon., 566.

Psittacula interfringillacea, BOURJ., Perr., t. 83.

Brotogeris kuhli, SWS., Class. of Birds, ii, 303.

Domicella kuhli, FINSCH, Die Papageien, ii, 1868, 749.

Locality: Washington Island, Fanning group, North Pacific Ocean.
Three specimens.

This bird is so rare in museums that a technical description of it will not be out of place in this connection. Bill short and stout, slightly shorter than the tarsus; upper mandible much hooked; tarsus and feet short and stout. The under surface of the neck and extending half-way around on the sides, the side of the head below the eyes, the breast, and the abdomen bright scarlet; the same color extends up on the side of the head at the base of the bill to very near the nostril. The scarlet color is confined to the terminal portion of the feather; the basal half is grayish-brown, slightly tinged with green—under the wings the green color predominates on the basal half. The lower portion of the tibia violet; the lengthened feathers of the crest green on the forehead and purple on the top and back of the head; the back and upper wing-coverts green; rump and upper tail-coverts greenish-yellow; the colors of the rump, abdomen, and tibia mingle on the long feathers of the thigh; a short line of yellow sprinkled with red at the bend of the wing; the short under wing-feathers green; the rest of the under surface of the wing grayish-brown, glossy in appearance; a narrow line of light blue on the outer margin of the wing; the edge of the outer web of two or three of the longest primaries margined with the same color; the margins of the other primaries green; the rest of the outer web, the shaft, and the inner web of the primaries and secondaries, as well as the apices of the primaries, brownish-black; the under tail-coverts scarlet and yellow, a mixture of the colors of the rump and abdomen; the outer web of the tail-feathers violet; the inner scarlet, tips green. Lower mandible yellow; upper light brown; tarsus and feet light brown.

Total length about 8.00 inches; bill from feathers on the side of the head 0.50; wing 5.20; tail 3.20; tarsus 0.60; middle toe 0.65; claw 0.30.

The following concerning this bird is taken from Finsch's "Die Papageien":—"This is one of the rarest parrots existing. It is to be found only in a few museums. It was erroneously said by Wagler to come from the Sandwich Islands. Latterly, this rare species does not seem to come to Europe at all, which is surprising, inasmuch as the Society Islands, which thus far have been regarded as their only home, have considerable traffic with Europe. As a special locality, Vigors mentions the island of Tuhutitiruha [*sic*] near Tahiti; Lesson gives Borabora. Bourjot's specimen in the Paris Museum is said to have come from Fanning Island, northwest of Christmas, and northeast of the Phoenix group. But, although everything is diametrically opposed to this statement, it may, nevertheless, not be improbable that this very island is its true home."

From the foregoing statement, it is evident that much uncertainty existed in regard to the habitat of *C. kuhli*, with the weight of the testimony inclining toward the Society Islands. It is our pleasure to have dispelled the doubt, and to have assigned the bird to its only true homes,—Washington and Fanning islands of the Fanning group. It is quite natural that such an opinion should prevail, and it is thus that we would account for it. Natives of the southern groups visit these islands periodically, to make cocoanut-oil. We found a party of them on Washington Island at the time of our visit, and in the possession of the men were a number of the lories that had been caught and tamed. It is evident that when these men return to their homes, they carry the birds along with them, and in this way they have probably fallen into the hands of collectors, who have them sent to Europe as coming from the Society Islands.

Fanning Island is situated about seventy miles to the south of Washington Island. It possesses a good anchorage, and has been visited a number of times by exploring expeditions; and, it is probable that Bourjot's specimen reached Europe through one of these. The island was discovered by Capt. Edmund Fanning, an American sailor, in 1798, and it is evident from the following untechnical description, copied from his "Voyages", that the lory was found living there at the time of his visits:—"Amongst the birds was one species about the size of our robin [*Turdus migratorius*]; with a breast of scarlet-colored feathers, the under portion

of the body being finished off with bright red, the neck of a golden color, back a lively green, with a yellow beak, except the very points, which were of a light dun color, the wings and tail being both of a jet black, and the last tipped off with white; it was a most beautiful and lovely bird, with its brilliant and richly variegated plumage. We were much chagrined, while observing these, to see a man-of-war hawk flying by with one in his mouth, apparently having just caught it." If we are allowed to state our own opinion in regard to the last sentence of this quotation, we would suggest that it was the red throat of the man-of-war hawk, and not a parrot, which our narrator saw.

When the islander wishes to take the lories alive, he provides himself with two pieces of bamboo, each about a yard long. On the end of one he perches a tame bird, and from the extremity of the other suspends a short running noose made of cocoanut-fibers. The decoy bird as it is carried about among the cocoanut-trees utters a harsh, rasping sound, and wild birds fly down from the trees and alight alongside it on the bamboo stick, when by means of the other stick they are skillfully noosed.

When caged aboard the ship, they exhibited as pretty a picture of love as one can imagine, well meriting their name of "*love-birds*". They sat billing and smoothing each other's feathers for hours, and as night came on two would get together and sleep with heads turned toward each other. They lived in confinement but a very short time and bore it badly. At times, even while we stood watching their lively antics, one would tumble off its perch and die, apparently in convulsions.

The islands on which these birds are found are very small, and it would not require a very great effort to totally exterminate them.

STRIGIDÆ.

OTUS BRACHYOTUS, (Gm.) Boie [No. 67365].

Strix brachyotus, Gm., Syst. Nat., i, 1788, 289.

Otus brachyotus, BOIE, Isis, 549.

Brachyotus palustris, GOULD, B. Eur., pl. 40.—COUES, Key N. A. Birds, 1872, 204; Birds Northwest, 1874, 306.

Brachyotus cassini, BREW., Proc. Boston Soc., 1856.—BD., Birds N. Am., 1858, 54.

Otus (Brachyotus) brachyotus, BD., BREW., & RIDG., N. A. Birds, iii, 1874, 22.

Locality: Talcahuano, Chili. One specimen.

FALCONIDÆ.

PANDION HALIÆTUS, (*Linn.*) *Cuv.* [No. 70648].

Falco haliætus, LINN., Syst. Nat., i, 1766, 129.

Pandion haliætus, CUV., Règne Anim., i, 316.—COUES, Key N. A. Birds, 1872, 219; Birds Northwest, 1874, 367.

Pandion carolinensis, BP., List, 3.

Pandion haliætus var. *carolinensis*, RIDG., Proc. Acad. Nat. Sci. Phila., 1870, 143.—BD., BREW., & RIDG., N. A. Birds, iii, 184.

Pandion leucocephalus, GOULD, Syn. B. Aust., i, 22; Birds Aust., pl. 6.

Pandion haliætus var. *leucocephala*, RIDG.—BD., BREW. & RIDG., N. A. Birds, iii, 183.

Locality: San Geronimo Island, Pacific coast of Lower California. One specimen. We observed a number of old nests on this island, built, in the absence of trees, upon high points of rock. At a place on the gulf coast of the peninsula, an osprey was observed breeding in February, and we procured some of its eggs.

CHARADRIDÆ.

SQUATAROLA HELVETICA, (*Linn.*) *Brehm* [No. 70449].

Tringa helvetica, LINN., Syst. Nat., i, 1766, 250.

Squatarola helvetica, BREHM, V. D., 554.—BD., Birds N. Am., 697.—COUES, Key N. A. Birds, 243; Birds Northwest, 448.

Fanellus helveticus, VIEILL., Ency. Méth., iii, 1077.

Charadrius helveticus, LICHT., Verzeich., No. 728.—AUD., Orn. Biog., iv, 280, pl. 334.

Charadrius (*Squatarola*) *helvetica*, RIDG., Ann. Lyc. N. Y., x, 1874, 383.

Tringa varia, LINN., Syst. Nat., i, 1766, 252.

Charadrius varius, FINSCH & HARTL., Vög. Ost-Afr., 1871, 644.

Pluvialis varius, SCHL., Mus. P.-B., *Cursores*, 1865, 53.

Tringa squatarola, LINN., Syst. Nat., i, 1766, 252.

Pluvialis squatarola, MACGILL, Man. N. H. Orn., ii, 48.

The complete synonymy of the species may be found in Coues's Birds of the Northwest.

Locality: San Geronimo Island. One specimen.

CHARADRIUS FULVUS, *Gm.* [Nos. 67338, 67339].

Charadrius fulvus, GM., Syst. Nat., i, 1788, 687.—COUES, Birds N. W., 1874, 449.

Pluvialis fulvus, BP., C. R., 417.

Charadrius pluvialis, HORSF., Linn. Tr., xiii, 1822, 187.

Charadrius xanthocephalus, WAGL., S. A., 1827.

Pluvialis xanthocephalus, BP., C. R., 417.

Charadrius taitensis, LESS., Man., ii, 321.

Pluvialis taitensis, BP., C. R., 417.

Charadrius virginianus, JARD. & SELT., Ill., ii, pl. 85.

Charadrius glaucopus, FORST., Descr. An., ed. Licht., 1844, 176.

Charadrius longipes, "TEM. Mus. Lugdun."

Pluvialis longipes, BP., C. R., 417.

Charadrius auratus orientalis, TEMM. SCHL., Faun. Japon., pl. 62.

Charadrius auratus, SCHRENCK, Reise Amur, 1860, 410.

Locality: Oahu, Hawaiian Islands. Two specimens. In regard to the habits of these birds, we were informed by residents of the island that they make their first annual appearance about September. When they arrive, they are very poor and weak, having evidently been on a lengthy voyage and been deprived of food for a long time. During their stay through the winter, they become very fat. About March or April, they begin to prepare for their departure. They can be seen during the day, at this time, taking long or short flights out at sea and returning again to the island. This exercise is undoubtedly for the purpose of strengthening themselves for the final effort—their muscles during their winter's life of luxury and ease having become flabby and feeble. We have met them at sea, a long distance from any land, very much exhausted, and have known them to take refuge aboard the ship, where, if not molested, they would remain until we neared land.

HÆMATOPODIDÆ.

HÆMATOPUS NIGER, *Pallas* [No. 70650].

Hæmatopus niger, PALLAS, Zoog. Rosso-Asiat., ii, 1811, 131.—COUES, Key N. A. Birds, 1872, 246.

Hæmatopus bachmani, AUD., Orn. Biog., v, 1839, 245, pl. 427.

Locality: Saint Martin's Island, Pacific coast of Lower California. One specimen.

STREPSILAS INTERPRES MELANOCEPHALUS, (*Vig.*) *Coues* [No. 70651].

Strepsilas melanocephalus, VIG., Z. J., iv, 1829, 356.—CASS., Baird's N. Am. Birds, 1858, 702.

Strepsilas interpres var. *melanocephalus*, COUES, Key N. A. Birds, 1872, 246; Birds Northwest, 1874, 459.

Locality: San Geronimo Island. One specimen. A characteristic example of this peculiar form, entirely dusky and white, without a trace of rufous coloration. The feet also are dark-colored, being apparently blackish-olive.

Bull. N. M. No. 7—2

SCOLOPACIDÆ.

TRINGA MINUTILLA, Vieill. [Nos. 70652, 70653, 70654, 70655.]

Tringa minutilla, VIEILL., Nouv. Diet. d'Hist. Nat., xxxiv, 1819, 452.—COUES, Key N.

A. Birds, 1872, 254; Birds Northwest, 1874, 482.

Actodromus minutilla, BP., Comp. Rendus, 1856.

Actodromas minutilla, COUES, Proc. Acad. Nat. Sci. Phila., 1861, 191, 230.

Tringa pusilla, WILS., Am. Orn., v, 1813, 32, pl 37, f. 4 (not of European writers).

Pelidna pusilla, BP., List, 1838, 50.

Tringa wilsoni, NUTT., Man., ii, 1834, 121.—BP., Birds N. Am., 1858, 721.

Actodromus wilsoni, BP., Comp. Rendus, 1856.

Locality: San Geronimo Island. Several specimens.

CALIDRIS ARENARIA, (Linn.) Illiger [Nos. 70656, 70657, 70658].

Tringa arenaria, LINN., Syst. Nat., i, 1766, 251.

Calidris arenaria, ILL., Prod., 1811, 249.—BP., Birds N. Am., 1858, 723.—COUES, Key N.

A. Birds, 1872, 257, f. 167; Birds Northwest, 1874, 492.

Charadrius calidris, LINN., Syst. Nat., i, 1766, 255.

Arenaria calidris, MEYER, Taschen. Deutschl. Vög., 68, pl. 59, f. 4.

Charadrius rubidus, GM., Syst. Nat., i, 1788, 688.

Arenaria vulgaris, BECHST., Taschen. Deutschl., ii, 462.

Arenaria grisea, BECHST., Naturg. Deutschl., iv, 368.

Calidris grisea, BREHM, Vög. Deutschl., 674.

Trynga tridactyla, PALL., Zoog. R.-A., ii, 1811, 198.

Calidris tringoides, VIEILL., Gal. Ois., ii, 1834, 95, pl. 234.

Calidris americana, BREHM, Vög. Deutschl., 1831, 695.

Calidris nigellus, VIEILL. (vide Gray's Hand-List, No. 10324).

Localities: San Geronimo Island and La Libertad, Sonora, Mexico.
Several specimens.

TOTANUS SEMIPALMATUS, (Gm.) Temm. [No. 70659].

Scolopax semipalmata, GM., Syst. Nat., i, 1788, 659.

Totanus semipalmatus, TEMM., Man. Orn., ii, 637.—COUES, Key N. A. Birds, 1872, 258;
Birds Northwest, 1874, 494.

Totanus (Catoptrophorus) semipalmatus, BP., Syn., 1828, 328.

Catoptrophorus semipalmatus, BP., List, 1838, 31.

Glottis semipalmata, NILSSON, Fn. Suec., 1817.

Hodites semipalmata, KAUP, Sk. Ent. Eur., 1829.

Symphemia semipalmata, HARTL., Rev. Zool., 1845, 342.—BP., Birds N. Am., 1858, 729.

Totanus crassirostris, VIEILL., Nouv. Diet. d'Hist. Nat., 1816, 406.

Symphemia atlantica, RAFINESQUE, Jour. Phys., lxxxviii, 1819, 417.

Locality: San Geronimo. One specimen. Various species of waders were particularly abundant on this island.

HETEROSCELUS INCANUS, (Gm.) Coues [No. 67321].

- Scolopax incana*, GMEL., Syst. Nat., i, 1788, 658,
Tringa glareola, PALLAS, Zoog. Ross.-As., ii, 1811, 194, pl. 60.
Totanus brevipes, VIEILL., Nouv. Dict. d'Hist. Nat., vi, 1816, 410.
Scolopax undulata, FORST., Descr. An., ed. Licht, 1844, 173.
Scolopax pacifica, FORST., Descr. An., ed. Licht., 1844, 174.
Totanus oceanicus, LESS., Consp. Buff., 1847, 244.
Totanus polynesiæ, PEALE, U. S. Expl. Exped., Orn., 1848, 237.
Totanus fuliginosus, GOULD, Voy. Beagle, Birds, 1841, 130.
Heteroscelus brevipes, BD., Birds N. Am., 1858, 734, pl. 88.
Heteroscelus incanus, COUES, Key N. A. Birds, 1872, 261.

Locality: Palmyra Island, Fanning group, North Pacific Ocean.

NUMENIUS FEMORALIS, Peale [No. 67336].

- Numenius femoralis*, PEALE, U. S. Expl. Exped., Orn. 1848, 233, pl. 37.—COUES, Checklist N. A. Birds, 1874, 135.

Locality: Palmyra Island. Very abundant on this island. A few only were seen on Christmas and the other islands of the group.

RALLIDÆ.

GALLINULA SANDVICENSIS, Streets [No. 67361].

- "*Gallinula chloropus* AUD."(=*G. galeata*), PEALE, U. S. Expl. Exped., Orn., 1848, 220 (nec auct.).
Gallinula sandvicensis, STREETS, Ibis, i, 4th series, 1877, p. 25, fig.

Frontal plate very large, terminating squarely on the top of the head, much inflated, the posterior margin on a line with the posterior border of the orbit; latterly, it encroaches on the orbit, being separated from it by a very narrow feathered space; the bill shorter than the head, thick, compressed; wings rather short in proportion to the size of the species, when compared with other species of the same group; first primary shorter than the second; second and third of equal lengths, the rest graduated; tail short; tarsus rather long and stout, rounded in front, and compressed posteriorly; toes and claws long and robust.

The entire under surface of the body of one color, which is a dark slaty; no marks of white on the abdomen; the head and neck all around much darker than the rest of the body—nearly black, with a slight brownish tinge; a few of the long feathers of the flanks with long spots of white on the superior web; the edge of the wing at the bend, and the external margin of the outer web of the first primary marked with a very constricted line of white; the under surface of the wing of the

same color as the under parts of the body; the longer under tail-coverts pure white, the rest black; the entire upper parts, including the upper surfaces of the wings and tail, olive-brown; this color deepest on the rump, and fading out on the neck and the exterior portions of the wings; the tips of the tail-feathers, and the shafts of the feathers brownish-black.

The frontal plate and bill bright crimson, the latter tipped with yellow; the tibia naked for about an inch, and surrounded by a bright crimson ring; a decided crimson blush on the front of the tarsus, the color deepens on the sides; feet pea-green.

Total length about 13.50 inches; wing 6.50; tail 3.00; bill along the commissure 1.20; from the feathers on the side of the head 1.00; along the culmen, including the frontal plate, 1.65; breadth of the frontal plate 0.50; length, from the margin of the feathers on the side of the bill, 0.70; tarsus 2.00; middle toe and claw 3.00.

To sum up;—the proportions of *Gallinula sandvicensis*, and the quadrate form of the frontal plate show that its strongest affinities are with *Gallinula galeata*, rather than with any other member of the group; but the greater extent of the frontal plate, the shorter wing, the absence of white on the abdomen and on the under surface of the wing, as well as its reduction to a mere trace on the margin of the latter, the more robust and different form of the tarsus, being broader and more rounded in front, as well as the great difference in the color of the tarsus, are characters which separate it immediately from *G. galeata*, and render its identification easy. The characters just enumerated, in addition to its larger size and the quadrate frontal plate, separate it *a fortiori* from the *G. chloropus*.

Locality: Oahu, Hawaiian Islands. The only direct reference to this bird which I have been able to find is made by Peale in the Ornithology of the United States Exploring Expedition, page 220. He undoubtedly obtained a specimen from the island of Oahu, but the skin, he states, was lost. In the description which he gives from his field-notes, he calls the bird *Gallinula chloropus* Aud., *i. e.* *G. galeata*. The allusion which he makes, however, to the crimson-colored tarsi identifies his bird at once with our species. Gray, in his Hand-List of Birds, gives the Sandwich Islands as a habitat of *G. chloropus* Aud., as do also Hartlaub and Finsch, in the table of distribution of Central Polynesian birds, in the introduction to their work, "Die Ornithologie der Viti,

Samoa-, und Tonga-Inseln." It is highly probable that both of these authorities based their statements upon Peale's original reference.

FULICA ALAI, *Peale* [No. 67360].

Fulica alai, PEALE, U. S. Expl. Exped., 1848, Orn., 224, pl. lxiii, f. 2.

Locality: Oahu, Hawaiian Islands.

ANATIDÆ.

CHAULELASMUS COUESI, *Streets* [Nos. 67324, 67325].

Chaulelasmus couesi, STREETS, Bulletin of the Nuttall Ornithological Club, vol. i, No. 2, 46.

Bill nearly as long as the head, about as deep as broad at the base, depressed anteriorly, sides nearly parallel, converging slightly toward the base; tip rounded, and unguis abruptly curved; frontal angle short and obtuse; dorsal line at first sloping—rather more so than in *C. streperus*—anterior portion broad, straight, and flattened. Internal lamellæ numerous, small and closely packed, about seventy-five in number—in *streperus* only about fifty. Nostrils sub-basal, lateral, large, oblong.

Plumage (immature).—Head above dark brown, the apical portion of the feathers of a lighter shade than the basal, those on the frontal region with the central portion black, and the edges brownish-white; throat and sides of head brownish-white, a small brown spot at the extremity of each feather, shafts brown, on the lower portion of the neck, and on breast all around the feathers are marked with concentric bars of black and light reddish-brown; under surface of the body white, with a broad dark band across the extremity of each feather, giving to this region a mottled appearance; toward the tail, the white of the abdomen assumes a dull reddish-brown tinge; a decided brownish-red color on the flanks, and on the sides of the body covered by the wings. On the back, the plumage is more mature. Color dark brown, marked transversely with fine wavy lines of black and white; scapulars dark brown, fringed with a narrow rim of reddish-brown; middle wing-coverts chestnut; the greater a velvety-black; speculum pure white, the inner webs of the white feathers being grayish-brown; on the third feather of the speculum, counting from within, the white gives place to a hoary-gray, with a black outer margin; the primaries light brown, with the portions of both webs nearest the shaft somewhat lighter. Tail containing fourteen feathers; color hoary plumbeous-gray, under surface lighter and shining; under tail-coverts crossed by transverse bars of

black and white; upper coverts composed of dark brown and black feathers intermingled. Under wing-coverts and axillars pure white. Bill and feet black; the inner side of the tarsus is perceptibly lighter than the feet. Tibia bare for about half an inch.

Length 17 inches; wing 8; tarsus 1.40; commissure 1.65; culmen 1.45; height and breadth of bill at base 0.55; average width of bill 0.55. First toe 0.30; second 1.48, including claw shorter than the third toe without claw; third toe 1.88 without claw, longer than the outer toe without claw; outer toe 1.75.

A female is similar, but with little trace of the peculiar wing-markings, both chestnut and black being wanting, and the speculum being hoary-gray instead of white. Both the specimens before me are immature; the adults, it is presumed, will show the peculiar vermiculated appearance of *C. streperus*. They resemble the immature condition of *C. streperus* so closely that one description of the coloration would answer for both species; but the *C. couesi* is immediately distinguished by its greatly inferior size, which hardly exceeds that of a teal, the different color of the bill and feet, and the singular discrepancy in the lamellæ of the bill, which are much smaller, and one-third more numerous.

Locality: Washington or New York Island, Fanning group.

The discovery of this duck is highly interesting from the fact that it is the second known representative of a genus that is almost world-wide in its distribution. The present species is as restricted in its habitat as the other is wide spread—being confined to the limited area of a coral island in the mid-Pacific.

I dedicate this species to one of our most distinguished ornithologists, Dr. Elliott Coues, U. S. A., as a slight testimonial of regard, and in consideration of the service which he has rendered to the science of ornithology.

SULIDÆ.

SULA LEUCOGASTRA, (Bodd.) Salv. [No. 70660].

Petit Fou, BUFF., Pl. Enl., 973.

Pelecanus leucogaster, BODD., Tabl. Pl. Enl., 57.

Dysporus leucogaster, SUNDEV., Proc. Zool. Soc. London, 1871, 125.

'*Sula fiber*, LINN.', SCL. & SALV., Nomencl., 124.

Sula leucogastra, SALV., Trans. Zool. Soc. London, ix, 1876, 496.

Sula fusca, AUD., Birds Am., vii, 1844, 57, pl. 426.

Sula fiber, COUES, Key N. A. Birds, 1872, 298.

This is the *Sula fusca* of earlier American ornithologists, and the *Sula fiber* of the more recent writers; but, according to late authorities, the

name *fiber* should be used as a synonym of *Sula piscator*, having been given by Linnæus to the young of that species.

Locality: Tiburon Island, Gulf of California. This is an abundant species in the gulf. It was breeding in April. The nest from which our specimen was taken contained two eggs, differing remarkably in size: one measuring 2.35 by 1.70; the other only 2.20 by 1.50. They are of the usual elliptical shape, greenish-white, with the ordinary, thick, white, calcareous incrustation.

SULA PISCATOR, (*Lynn.*) *Bp.* [Nos. 67319, 67327, 67332].

Pelecanus piscator, LINN., Syst. Nat., i, 1766, 217.

Sula candida, BRISS., Steph. Gen. Zoöl., xiii, 1826, 103.

Sula erythrorhyncha, LESS., Traité, i, 1831, 601.

Sula rubripes, GOULD, Proc. Zoöl. Soc. London, 1837, 156.

Sula rubripeda, PEALE, U. S. Expl. Exped., Orn., 1848, 274.

Sula piscator, BP., Consp. Av., ii, 1857, 166.

Locality: Fanning group, North Pacific. Several specimens were taken at sea in the vicinity of this group of islands. When far away from land, they flew aboard the ship in the evenings, and roosted on the yards. They exhibited no signs of fear, but were easily captured by the men who went aloft. In the majority of our specimens, the tail is dark—it is white in the adult plumage. On Palmyra Island, their principal breeding-place, the period of their incubation was over at the time of our visit in December, but the young were not yet fledged. The latter were very numerous; they covered the trees and bushes, and looked like great balls of snow-white down. The nests are rudely constructed of coarse twigs, and are built on the low trees.

We arrived at Christmas Island one month later, in January, and there we found the gannets still sitting on their eggs; few or no young were to be seen. This difference is probably induced by the physical conditions surrounding them. One of the islands is situated almost directly on the equator, exposed to the fiercest rays of a tropical sun; it is devoid of fresh water, and it rarely or never rains; the vegetation is scanty and stunted, and life in general has a very unequal struggle for existence. On the other island, Palmyra, a condition of things directly opposite to these exists. The gannets of Christmas Island have a very curious habit, which, as far as our observations extended, is confined to those of that island. Under their nests, which were quite low on account of the stunted condition of the shrubbery, were mounds one and two feet high, built of twigs, and in some instances

solidly cemented together by their excrement. It probably affords them diversion during the monotonous period of incubation to break off all the twigs within reach of their bill, and to drop them under their nests. These mounds furnish evidence of the nests being occupied for several successive years; for the lean bushes could not furnish a sufficient amount of twigs to build them up in a single breeding-season.

One is the usual number of eggs, though sometimes two were found in the same nest. They are somewhat larger, but in every other respect similar to the eggs of *Sula leucogastra*.

SULA CYANOPS, *Sunder.* [Nos. 67315, 67316].

Dysporus cyanops, SUNDEV., Phys. Tidskr. Lund., 1837, pt. 5.

Sula cyanops, SUNDEV., Isis, 1842, 858.

Sula personata, GOULD, Proc. Zool. Soc. London, 1846, 21.

Sula piscator, PEALE, U. S. Expl. Exped., Orn., 1848, 273.

Locality: Christmas Island. One specimen in immature plumage. The whole of the upper surface of the body dark brown, mottled with white. The brown color of the back and upper surface of the wings has a grayish tinge; the head and neck all around dark brown, as in *S. leucogastra*, except that the dark color does not extend as far down on the breast as in the latter. The general system of coloration is much the same as in *leucogastra*. If we are to learn anything from the transitional plumages of birds, may it not be that they show us the parent types from which the species are progressively developed? Many instances might be mentioned where the immature plumages of birds represent the perfect plumage of some closely allied species.

S. cyanops were breeding on Christmas Island. They were not very abundant. They build no nest, but scratch a slight concavity in the fine coral sand, where the egg is deposited. All of those observed breeding on Christmas Island were in full adult plumage. One, a young bird in the *leucogastra* style of dress, was seen nesting on Palmyra. Its nest was on the ground, and was well constructed of grass. This is another exemplification of the rule observed all along of the different habits of the same species of birds on these two islands.

GRACULIDÆ.

GRACULUS BRASILIANUS, (*Gm.*) Gray [No. 67369].

Procellaria brasiliiana, Gm., Syst. Nat., i, 1788, 564.

Puffinus brasiliensis, Br., Av., vi, 1760, 138, sp. 4.

- Pelecanus vigna*, VIEILL., Encyclop. Méthod., i, 1823, 342.
Haliæus brasiliæus, LICHT., Doubl. d. Zool. Mus., 1823, 86, 908.
Graculus brasiliæus, GRAY, Gen. of Birds, t. — .
Phalacrocorax graculus, GOULD, B. of Eur., t. 408.
Phalacrocorax niger, KING, Zoöl. Jour., iv, 1828, 101, sp. 63.
Carbo mystacalis, LESS., Traité d'Orn., 1831, 604.
Carbo brasiliæus, SPIX, Av. Brasil, ii, 1824, t. 106.
Zaramagullon negro, AZARA, Apunt. Hist. Nat. Paxaros del Paraguay, &c., iii, —, 395, 423.
 Locality: Concepcion Bay, Chili.

TACHYPETIDÆ.

TACHYPETES MINOR, (*Gm.*) *Illig.* [No. 67320].

- Pelecanus minor*, GM., Syst. Nat., i, 1783, 572.
Pelecanus palmerstoni, GM., Syst. Nat., i, 1783, 573.
Fregata minor, BR., Av., vi, 1760, 509, sp. 7.
Tachypetes minor, ILLIG., Prodro., 1811.
Attagen ariel, GOULD, Birds of Austr., vii, t. 72.
Tachypetes ariel, GRAY, Gen. Birds, t. 185.

Localities: Christmas and Palmyra Islands. One of the specimens a young bird with a white head. Not very abundant. They were not breeding on any of the islands at the time of our visit.

PHÆTHONTIDÆ.

PHÆTHON RUBRICAUDUS, *Bodd.* [Nos. 67329, 67330].

- Phæthon rubricauda*, BODD., Tabl. Pl. Enl. d'Aub., 1783, 57.—BUFF., Pl. Enl., 979.
Phæthon phænicurus, GM., Syst. Nat., i, 1788, 583.
Phæthon æthereus, BLOXH., Voy. Blonde, 1826, 251.
Phænicurus rubricauda, BP., Consp. Av., ii, 1857, 183.

Locality: Christmas Island. Two specimens. One in immature plumage. The feathers of the whole upper surface of the head, neck, and body marked with transverse bars of black and white. Bill black. The elongated central tail-feathers absent. These birds were brought to the ship by the sailors from a distant part of the island. They were taken from off their nests, which were on the ground under low bushes. Egg white, speckled with brown.

LARIDÆ.

LARUS ARGENTATUS OCCIDENTALIS, (*Aud.*) *Cs.* [No. 70664].

- Larus occidentalis*, AUD., Orn. Biog., v, 1839, 320.
Glaucus occidentalis, BRUCH., J. f. O., 1853, 101.

Laroides occidentalis, BRUCH., J. f. O., 1855, 282.

Larus argentatus var. *occidentalis*, COUES, Key N. A. Birds, 1872, 312; Birds Northwest, 1874, 626.

Locality: Lower California. In perfect breeding-plumage, well illustrating this form in the strength of the bill, slaty-grayish shade of the mantle, &c.

LARUS (BLASIPUS) HEERMANNI, Cass. [Nos. 70665, 70666, 70667].

Larus heermanni, CASS., Proc. Acad. Nat. Sci. Phila., vi, 1852, 187; Illus., 1853, 28, pl. 5.

Larus (Blasipus) heermanni, SCL. & SALV., Proc. Zool. Soc. London, 1871, 574.—COUES, Birds Northwest, 1874, 641.

Blasipus heermanni, BP., Consp. Av., ii, 1856, 211.

Adelarus heermanni, BRUCH., J. f. O., 1853, 107; 1855, 279.

Larus belcheri, SCHL., Mus. P.-B., Lari, 9 (in part).

Larus (Blasipus) belcheri, COUES, Key N. A. Birds, 1872, 314 (in part).

Locality: Isla Raza, Gulf of California. Isla Raza is the particular breeding-place of these gulls in the gulf. It is a small, low island, about three-quarters of a mile long and half a mile wide. At the time of our visit (April), immense numbers of the birds were congregated there, preparatory to laying their eggs, which, however, they had not begun to deposit. We may safely say, without exaggeration, that there was a bird on every square foot of the ground, and others were continually hovering about overhead. Their incessant noise deadened all other sounds, and so intent were they in their all-absorbing duties of reproduction, that they seemed entirely unconscious of our presence amongst them. The formation of the island is a black volcanic rock, entirely destitute of vegetation. Through the long series of years during which these birds have made it a breeding-place, there has been going on a chemical reaction between the acids of their excrement and the bases of the rock, which has resulted in the formation of a new substance, composed largely of a tri-basic phosphate. This now forms (or did form) a thick layer, covering the whole surface of the island. On breaking open the bowlders, a sharp line of demarkation can be seen extending into the body of the rock showing the depth of the chemical reaction. The altered rock being a softer material than the original is easily pulverized and worn off by the constant attrition of the birds' feet during their breeding-season. In this way, the inequalities of the surface of the rocky islet have been smoothed over. A company has possession of the island, and is gathering the guano. Ten thousand tons have been removed, and it is calculated that six times that quantity still remains to be gathered (1875).

In perfect breeding-dress. The eyelids are red, like the bill.

HYDROCHELIDON LARIFORMIS, (Linn.) Coues [Nos. 70661, 70662].

Ballus lariformis, LINN., Syst. Nat., i, ed. 10, 1758, 153.

Sterna fissipes, LINN., Syst. Nat., i, 1766, 228.

Hydrochelidon fissipes, GRAY, Gen. of Birds, iii, 1849, 660.—COUES, Key, 1872, 323.

Sterna nigra, BRISS., Av., vi, 1760, 211, pl. 20. f. 1.

Hydrochelidon nigra, BOIE, Isis, 1822, 563.

Hydrochelidon nigrum, BP., List, 1838, 61.

Viralva nigra, LEACH, Gen. Zoöl., xiii, 1826, 167.

Sterna nævia, LINN., Syst. Nat., i, 1766, 228.

Sterna surinamensis, GM., Syst. Nat., i, 1788, 604.

Hydrochelidon surinamensis, BP., Comptes Rendus, 1856, 772.

Hydrochelidon (Pelodes) surinamensis, GRAY, Hand-List, iii, 1871, 122, No. 11074.

Hydrochelidon nigricans et obscura, BREHM, V. D., 1831, 794, 795.

Sterna plumbea, WILS., Am. Orn., vii, 1813, 83, pl. 60.

Hydrochelidon plumbea, LAWR., B. N. A., 1858, 864.

Hydrochelidon lariformis, COUES, Birds Northwest, 1874, 704.

Locality: Mita Point, Sinaloa, Mexico. Taken in May, at which period one had completed its breeding-dress, while the other had only begun to change its winter plumage.

STERNA (HALIPLANA) FULIGINOSA, Gm. [Nos. 67322, 67328, 67334].

Sterna fuliginosa, GM., Syst. Nat., i, 1788, 605.

Sterna (Onychoprion) fuliginosa, GRAY, List Br. B., 1863, 242.

Sterna (Haliplanes) fuliginosa, BLAS., List B. Eur., 22.

Sterna (Haliplana) fuliginosa, COUES, Key N. A. Birds, 1872, 322; Birds Northwest, 1874, 698.

Onychoprion fuliginosa, WAGL., Isis, 1832, 277.

Haliplana fuliginosa, WAGL., Isis, 1832, 1224.

Hydrochelidon fuliginosum, BP., List, 1838, 61.

Sterna serrata, FORST., Descr. An., ed. Licht, 1844, 276.

Onychoprion serrata, WAGL., Isis, 1832, 277.

Haliplana serrata, BP., Comptes Rendus, 1856, 772.

Sterna guttata, FORST., Descr. An., ed. Licht., 1844, 211.

Anous Pherminieri, LESS., Descr. Mammif. et Ois. 1847, 255.

Sterna luctuosa, PHIL. & LANDB., Wieg. Arch., 1866, 126.

Sterna fuliginosa var. *crissalis*, BD., apud LAWR., Proc. Boston Soc., 1871.

Locality: Palmyra Island, Fanning group. They were particularly abundant on this island only. We arrived amongst them at the commencement of their breeding-season. The spot which they had chosen for breeding purposes was the extreme eastern or windward point of the island, within a stone's throw of the breakers. They breed in commu-

nities; and so numerous were they on this occasion that they formed a cloud when they arose from the ground, and their clamor deadened the roar of the surf. They make no attempt at building a nest, but deposit their one egg anywhere on the bare ground. The eggs were almost as thick as the clinkers on the coral beach.

ANOUS STOLIDUS, (*Linn.*) Gray [Nos. 67323, 67326].

Sterna stolidus, LINN., Syst. Nat., i, 1766, 227.

Megalopterus stolidus, BP., List, 1838, 61.

Anous stolidus, GRAY, List Gen. of Birds, iii, 1841, 100.—COUES, Key N. A. Birds, 1872, 323; Birds Northwest, 1874, 710.

Anous niger, STEPH., Gen. Zoöl., xiii, 1826, 140.

Gavia leucoceps, SW., Classif. B., ii, 1837, 373.

Localities: Palmyra and Christmas Islands. Breeding in both localities. There was a marked difference in the habits of the birds of the two islands. On Palmyra, they build nests of twigs in the forks of the tallest trees; a few were observed to build nests in the cocoanut-trees at the bases of the leaves. On Christmas Island, where there are no trees, they lay their eggs on the bare ground within a circle of a few twigs.

GIGIS ALBA, (*Sparrm.*) Bp. [No. 67335].

Sterna alba, SPARRM., Mus. Carls., No. xi, 1786.

Sterna candida, GM., Syst. Nat., i, 1788, 607.

Gigis candida, WAGL., Isis, 1832, 1223.

Gigis alba, BP., Compt. Rend., 1856, 773.

Gigis nepoleonis, BP., Compt. Rend., 1856, 773.

Localities: Palmyra and Christmas Islands. These furnish us with another interesting example of the power of birds to conform to their surroundings in their breeding habits. They lay but one egg, which is very large for the size of the bird, and it was in every instance, on Palmyra Island, placed on the naked branch of a tree. In some cases, the diameter of the limb on which it rested barely exceeded that of the egg itself; yet there it remains during the whole period of incubation, and the narrow lodge is the resting-place of the young bird until it is able to fly. On Christmas Island, the same obstacle is in the way of the gratification of their desires as was mentioned in the case of the noddy terns, namely, the absence of trees, but the surfaces of the large coral blocks are made to serve their purposes equally as well. The *Gigis alba* exhibited a greater degree of curiosity than any of the other birds of the islands. They were continually hovering about over our heads when we were ashore, and, indeed, often seemed inclined to alight upon the theodolite while the officers were triangulating about the island.

PROCELLARIIDÆ.

ADAMASTOR CINEREUS, (Gm.) Coues [Nos. 67370, 67371].

Procellaria cinerea, GM., Syst. Nat., i, 1788, 563.

Puffinus cinereus, (GM.) LAWR., Birds N. A., 1858, 835.

Procellaria hasitata, FORST., Descr. An., ed. Licht., 1844, 208.

Puffinus hœsitatus, LAWR., Ann. Lyc. Nat. Hist. N. Y., 1853, vi, 5.

Adamastor typus, BP., Consp. Av., ii, 1856, 187.

Procellaria adamastor, SCHLEGEL, Monog. Proc. Mus. Pays-Bas, 1863, 25.

Adamastor cinereus, COUES, Proc. Acad. Nat. Sci. Phila., 1864, 119 (critical).

Locality: off Cape Horn.

PUFFINUS (NECTRIS) NATIVITATIS, Streets, n. sp. [No. 67318].

Bill shorter than the head, much shorter than the tarsus; size medium; sides compressed, as wide as high at the base; unguis moderate, much hooked; commissure slightly curved from base to unguis, convexity downward; the lower margin of the rami of the inferior mandible straight; unguis concave and slightly deflexed. Nasal tubes about one-fourth of the length of the culmen, broad, depressed, obliquely truncated anteriorly; the nostrils oval; internal septum broad; culmen sloping downward abruptly from the upper part of the nasal tubes, and then rising very gradually toward the unguis. Commissural margins of the upper and lower mandibles inflected. The feathers on the front sweeping across the base of the bill with a gently-rounded outline, gaining the edge of the mandible about three-tenths of an inch from the angle of the mouth; feathers on the side of the lower mandible do not reach quite as far forward as those on the culmen. Wings of moderate length, and all the primaries graduated, the first the longest; tail rounded, containing twelve graduated feathers. Tarsus slender and compressed, equal in length to the middle toe without claw; outer toe without its claw longer than the middle without the appendage, but including claws the middle toe is the longest; the tip of the claw of the inner toe falling short of the base of the middle claw one-tenth of an inch.

The entire coloration of the species sooty-black, without any mixture of gray, except on the chin, where it is very faint; somewhat darker on the head and upper parts, where it is more of a brownish-black; on the under parts, it is of a rich chocolate hue. Bill black; tarsus and feet brownish-black, somewhat lighter on their inner aspects. Primaries and tail-feathers scarcely darker than the rest of the plumage; shafts brown on the upper surface, those of the primaries with a longi-

tudinal line of white on the under surface; the under surface of the shafts of the tail-feathers presents three longitudinal parallel lines of white, one central and two lateral, with broad brownish interspaces.

Total length 14.50 inches; length of bill along the culmen 1.20 inches; along the commissure 1.80; from the feathers on the side of the upper mandible 1.50; from the feathers on the side of the lower mandible 1.35; height of bill at base 0.40; width about the same; length of the nasal tubes 0.30; wings, from the carpus, 9.70; tail 4.20; tarsus 1.70; middle toe and claw 2.00; outer toe and claw 1.90; inner toe and claw 1.65; hallux 0.12.

Locality: Christmas Island. One specimen. Captured on its nest.

The determination of this species is based upon Dr. Elliott Coues's "Critical Review of the Family Procellariidæ". Regarding this monograph as the latest and most exhaustive survey of this very difficult family, we find but one species that could in any way be confounded with the one under consideration, and that is *Nectris fuliginosus* Keys et Blas, a much larger species, and one, moreover, that is confined to the Atlantic Ocean. These two species (*fuliginosus* and *nativitatis*) are the only ones of the subgenus *Nectris* whose plumages are dark fuliginous without any admixture of white.

Kuhl's *Procellaria fuliginosa*, sp. 12, p. 142, is recognized as the *Pterodroma atlantica* Bp. = *Æstrelata fuliginosa* Coues, which is an Atlantic species, and is not a true puffin; the *Procellaria fuliginosa*, sp. 27, p. 148, of the same author, is a *Puffinus*, and is now known as the *pacificus*. Its flesh-colored bill and feet, however, immediately separate it from *nativitatis*. Exactly what is the *Nectris fuliginosa*, of Forster, no one seems to know. It is barely possible that it may be the species which we have just described as new; but there is no doubt that the latter is entirely distinct from all the other species which have been described by the old ornithologists under the name *fuliginosa*. If it be the one of which we have implied a doubt (this, however, cannot be proven), a re-description will not be amiss, and a re-naming will be demanded on account of the prior claim of another species to the same name.

ÆSTRELATA PARVIROSTRIS, (Peale) Coues. [Nos. 67317, 67331].

Procellaria parvirostris, PEALE, U. S. Expl. Exped., Orn., 1848, 298.

Rhantistes parvirostris, Bp., Compt. Rend., 1856, 768.

Æstrelata parvirostris, COUES, Proc. Acad. Nat. Sci. Phila., 1866, 146 (critical).

Locality: Christmas Island. Breeding in January. They make their

nests on the ground under low bushes. They merely scoop a hole in the ground for the egg. The eggs are large, rotund-elliptical, with a smooth, white, and translucent shell. They are such close setters that nothing could induce them to leave their eggs voluntarily. When we removed them from their nests they instantly returned to their duty on being released.

DIOMEDEA CULMINATA, Gould [No. 67368].

Diomedea cholorrhynchos, of AUDUBON's Works.

Diomedea culminata, GOULD, Ann. & Mag. N. H., 1844, xiii, 361.—COUES, Proc. Acad. Nat. Sci. Phila., 1866, 183 (critical).

Locality: at sea, off Cape Horn.

DIOMEDEA NIGRIPES, Aud. [Nos. 67362, 67363, 67364, 67365].

Diomedea nigripes, AUD., Orn. Biog., v, 1839, 327.—COUES, Proc. Acad. Nat. Sci. Phila., 1866, 178 (critical).

Diomedea brachyura juv., CASSIN, Illust. B. Cal. & Tex., 1853, 291.

Diomedea gibbosa, GOULD, Ann. & Mag. N. H., 1844, xiii, 361.—COUES, Proc. Acad. Nat. Sci. Phila., 1866, 180.

Locality: North Pacific Ocean. Captured at sea while on the passage between Honolulu and San Francisco. The series is a good one to illustrate the species in nearly all its stages of plumage, and notably that described by Gould as *D. gibbosa*, which is nothing more than the adult plumage of *nigripes*. Dr. Coues, in his excellent "Critical Review of the Family Procellariidae", alludes to this as the probable conclusion to be arrived at upon a more thorough investigation of the species. We have first presented to us the typical *nigripes*, with its uniformly dusky plumage. The white first makes its appearance on the basal portions of the upper and under tail-coverts; it increases in quantity until there is but a narrow rim of brown left at the apices of the feathers. In older specimens, the brown entirely disappears, and the whole of the crissum and upper coverts are pure white. We then find the white traveling upward and spreading itself over the abdomen. In those specimens that have the greatest amount of white on the under surface of the body, we find a widening area of the same color on the top of the head, spreading backward from the narrow rim that originally surrounded the base of the bill.

ALCIDÆ.

BRACHYRHAMPHUS CRAVERI, (*Salvad.*) Coues [No. 70663].

Uria craveri, SALVAD., Descr. Alt. Nuov. Ucc. Mus. di Torino, 1867, 17.

Brachyrhamphus craveri, COUES, Proc. Acad. Nat. Sci. Phila., 1868, 66.

Locality: Isla Raza, Gulf of California. An adult female in full plumage, taken in April, 1875. It was breeding in holes in the rocks, amid the innumerable gathering of *Larus heermanni*, already noticed. Eggs two, taken from a crevice of a rock at arm's length. These eggs resemble those of the tern, though rather elliptical-ovoid in shape. They differ from each other decidedly in the ground-color as well as in the markings. The darkest one is brownish-drab, with nearly half of the surface (on the larger end) heavily and confluent blotched with reddish-brown and dark brown, with a few neutral-tint shell-markings interspersed; the rest of the egg is sparsely sprinkled with smaller and more distinct markings of the same color. The ground of the other egg is clay-colored, or very pale stone-gray, with markings of the same colors as before, but less heavy, more distinct, and smaller. There is the same aggregation of spots about the larger end, but not so fully carried out, and the rest of the surface is more thickly and uniformly flecked than the same portion is on the other egg. The darker egg measured 2.05 by 1.40; the other 1.95 by 1.35. The eggs of the species, as far as we are aware, have not before been described.

The specimen of the bird is interesting as coming from far up the gulf, from virtually the same locality as the original of *Uria craveri*, if not from the identical spot, and is Signore Salvadori's bird exactly. As stated by Dr. Coues, in his Monograph (Proc. Acad. Nat. Sci. Phila., 1868, p. 66), it is very closely related to *B. hypoleucus*, the chief difference being, that in the latter the lining of the wings is entirely pure white, while in *craveri* the same part is dusky varied with white. In *craveri*, the line of demarkation between the blackish of the upper and the white of the under parts passes on the side of the head considerably below the eye; while in *hypoleucus* the blackish barely includes the eye, though extending a little farther down on the auriculars. Dr. Coues alludes to the "bare possibility" that *craveri* was the young of *hypoleucus*, a supposition disproved by finding it breeding. *B. craveri* can only be referred to *hypoleucus* now, upon the assumption that the latter is the winter plumage of the former, as all the specimens which have

come to hand thus far with the pure white lining of the wings were taken in winter, as far as known. Such an assumption would not be widely at variance with the known characters of the seasonal changes of plumage in some members of this family, but remains to be proven. Pending this determination, *craveri* should be recognized as a good species.

SPHENISCIDÆ.

SPHENISCUS HUMBOLDTI, *Meyen* [No. 67367].

Diomedea chilensis, MOLINA, Hist. Nat. Chili, 1786, 210.

Aptenodytes chilensis, GM., Syst. Nat., i, 1788, 559.

Aptenodytes molinae, LATH., Ind. Orn., ii, 1790, 881.

Spheniscus humboldti, MEYEN, Nov. Act. Acad. Cæs. Leop. Carol., 1834, xvi, suppl. i, 110, pl. xxi.

Locality: harbor of Talcahuano, Concepcion Bay, Chili.

Bull. N. M. No. 7—3

HERPETOLOGY.

HYLIDÆ.

HYLA REGILLA, *Baird & Girard* [No. 8572].

- Hyla regilla*, BAIRD & GIRARD, Proc. Acad. Nat. Sci., Phila., 1852, 174; 1853, 301.—
BAIRD, P. R. R. Rep., x, 1859, Williamson & Abbott's Route, Reptiles, 12, pl.
28, f. 3.—GIRARD, Herp. U. S. Expl. Exped., 60, pl. 3, f. 13-18.—COOPER
& SUCKLEY, Nat. Hist. Wash. Terr., 1860, 304.—COPE, Check-list, 1875, 30.
Hyla scapularis, HALLOWELL, Proc. Acad. Nat. Sci. Phila., 1852, 183; P. R. R. Rep.
x, 1859, Williamson's Route, Reptiles, 21.

Locality: Cerros Island, off the Pacific coast of Lower California. Near a spring of fresh water on the southeastern side of the island. Ground-color green; a narrow, deep-brown band extending from the nostril to the anterior margin of the orbit; a broader band of the same color from the posterior border of the orbit to the shoulder; the latter band margined below by a narrow rim of orange about half the breadth of the brown vitta; the side of the body between the shoulder and thigh spotted with brown; a V-shaped spot of brown between the eyes; two bands of the same color, one on either side the dorsal region, extending from the occiput to the sacrum; an oblong spot on the middle of the sacrum. The extremities ornamented with transverse series of broad spots. The entire under surface of the body yellow.

Heretofore this frog has been strictly confined to the Pacific region, where it is quite common. This is the first notice we have of its living in the Lower Californian region. The most southern locality whence it has been obtained previous to this is Tejon Pass (Hallowell, *P. A. N. S. Phila.*, 1852) in the southern portion of Alta California.

GECCONIDÆ.

DIPLODACTYLUS UNCTUS, *Cope* [No. 8571].

Diplodactylus unctus, COPE, Proc. Acad. Nat. Sci. Phila., 1863, 102; Check-list, 1875, 50.

Locality: Triunfo, Lower California.

The only way in which this specimen differs from Cope's original

description is in the arrangement of the color on the back. Though the plan of arrangement is the same, yet, instead of the color being placed so as to form five continuous blackish cross-bands from the base of the tail to the interseapular region, the bands are more or less interrupted, thereby giving to the region somewhat of a marbled appearance.

IGUANIDÆ.

PHRYNOSOMA HERNANDEZI, Cope [No. 8567].

Phrynosoma hernandesi, COPE, Check-list, 1875, 48.

Tapaya hernandesi, GIRARD, Herp. U. S. Expl. Exped., 1858, 395.—BAIRD, P. R. R. Rep., x, 1859, Whipple's Route, Reptiles, 38; U. S. and Mex. Bound. Surv., ii, pt. ii, 1859, Reptiles, 8.

Locality: Sonora, Mexico. Found living on the low, sandy, desert-like plains along the gulf coast. One of these interesting little animals was kept as a pet on board the ship until it died. After its death, its body was preserved in alcohol. When the collection was being examined attentively, in view to the determination of the species, the throat, mouth, and nostrils of this one were found to be completely clogged up with parasites, small round worms, from a half to three-quarters of an inch long. Its diet while in captivity consisted exclusively of flies and cockroaches, and it is highly probable that from the one or the other of these insects originated the parasites. The latter are now in the hands of an eminent helminthologist for determination.

SAUROMALUS ATER, Duméril [No. 8563].

Sauromalus ater, "DUMÉRIL, Arch. du Mus."—COPE, Check-list, 1875, 47.—COUES, Wheeler's Geographical and Geological Explorations and Survey West of the 100th Merid., vol. v, 1875, Zool., 600.

Euphyryne obesa, BAIRD, Proc. Acad. Nat. Sci. Phila., 1858, p. 253; U. S. and Mex. Bound. Surv., ii, pt. ii, 1859, 6, pl. 27.—COPE, Proc. Acad. Nat. Sci. Phila., 1866, 310.—YARROW, Wheeler's Geographical and Geological Explor. and Surv. West of the 100th Merid., vol. v, 1875, Zool., 559.

Locality: Angel Island, Gulf of California. Abundant on this island. The largest specimen procured measured 22 inches in length. The old individuals are marked with one, two, or three large, rounded or irregular, grayish blotches somewhere on their body. They were easily captured by hand as they lay in the grass, sunning themselves. They eyed us timidly as we moved them about with our feet; then, apparently perceiving their danger, would start up and run with considerable

swiftness to their burrows, which are generally in the midst of a dense clump of bushes, or under rocks. When once in their holes, so tenaciously do they hold on with their stout claws that the strength of a single person is not sufficient to drag them out. Their bleached remains scattered about over the island attest that they fall easy victims to the birds of prey.

Exeretæ, supposed to be of this Lizard, deposited in the National Museum at Washington, and collected from the high lands of Utah and New Mexico by Dr. Yarrow, of Wheeler's Geographical and Geological Survey, bear no resemblance to what was seen common around the mouths of their burrows on Angel Island. In the first place, the excrement was not deposited in masses, but was scattered about. The scybalæ were oblong, and seemingly composed of the shells of seeds and other indigestible matter of plants. They were dry and porous, and so loosely held together that they could be readily pulverized under the foot.

UTA STANSBURIANA, Baird & Girard [Nos. 8570, 8569].

Uta stansburiana, BAIRD & GIRARD, Proc. Acad. Nat. Sci. Phila., 1852, 69; Stansbury's Rep. Exped. Great Salt Lake, 345, pl. 5, f. 4-5.—BAIRD, U. S. & Mex. Bound. Surv., ii, pt. ii, 1859, Reptiles, 7; P. R. R. Rep., x, 1859, Whipple's Route, Reptiles, 37.—COPE, Check-list, 1875, 48.—YARROW, Wheeler's Geogr. and Geol. Expl. and Surv. West of the 100th Merid., v, 1875, Zool., 563.—COUES, op. cit., v, 1875, Zool., 596.

Locality: Cerros Island, off the Pacific coast of the peninsula of Lower California, and also from the mainland. The color of the male is brown above, with whitish-yellow irregular dots. The double row of dorsal patches of a deeper black, which is sometimes observed in this species, is more or less confluent into four longitudinal lines in our specimen. The female is uniformly pale olive above. Both sexes are yellowish below, greenish along the sides, and bluish under the throat. There is also present in both sexes a deep indigo spot on the sides, just posterior to the axilla.

CHIROTIDÆ.

CHIROTES CANALICULATUS, Cuvier [No. 8568].

Le Canellé, LACÉP., Hist. Quad. Ovip., i, 613, pl. 41.

Le Bimane canellé, CUV., Règne Anim., (1re édit.) ii, 57; (2re édit.) ii, 67.

Bipes canaliculatus, BONNAT., Encyclop. Erp., 68, pl. 12, f. 6.—LATR., Hist. Nat. Rept. ii, 90.

- Lacerta lumbricoides*, SHAW, Nat. Misc., vi ; Gener. Zoöl., iii, 311.
Lacerta mexicana, DONND., Zoöl. Beitr., iii, 135.
Lacerta suleata, SUCKOW, Thier., iii, 147.
Chalcides propus, DAUD., Hist. Rept., iv, 372, pl. 58, f. 4.
Chamaesaura propus, SCHNEID., Hist. Amphib., ii, 211.
Bimanns propus, OPPEL., Die Ordnung. Famil. und Gattung. Rept., 46.
Chirote mexican, BORY DE SAINT VINCENT, Résumé d'Erpet., 141, pl. 27, f. 1.
Chirote, FLEM., Ph. Zoöl., ii, 278.—EICHW., Zoöl. Spec. Ross. Polon., iii, 180.—JAMES, LONG'S Exped. to the Rocky Mts., i, 484.—HARLAN, Jour. Acad. Nat. Sci. Phila., vi, 55.—GRAY, Cat. Tort., 1844, 74 ; Cat. Shield Rept., pt. ii, 34.
Chirote canaliculatus, DUM., Collect. Mus. Par.—MERREM., Tent., 181.—FITZ., Neue Classif. Rept., 53.—GUÉR., Icon. Règne Anim. Cuv. Rept., pl. 16, f. 3.—SCHNZ., Natürg. und Abbild. Rept., 107, pl. 41, f. 2.—DUM. & BIB., Hist. des Rept., v, 1839, 474.—GRAY, P. Z. Soc., 1865, 446.

Locality : La Paz, Lower California. Obtained through the agency of the United States consul at La Paz. The Mexican name for this reptile is *ajolote*, which, however, cannot be considered as specific or even generic, as it is applied to several species of *Amphisbænidae*. I was informed that it lives mostly underground, coming out only at night. Its rudimentary eyes and the arrangement and shape of the feet, which are similar to those of the mole, would suggest subterrestrial habits, as would also the absence of coloring matter in its integument. The specimen obtained in Lower California differs in no respect from the description given in Duméril and Bibron's "Histoire des Reptiles". Reference to the above biographical notice will show that it has been extensively quoted as coming from Mexico, which so far has been regarded as its only habitat. The only assurance we have of its ever having been found within the limits of the United States rests upon the somewhat doubtful statement in "Long's Expedition to the Rocky Mountains". The testimony is as follows :—"We observed, in repeated instances, several individuals of a singular genus of Reptiles (*Chirote*, Cuv.), which in form resemble short Serpents, but are more closely allied to the Lizards by being furnished with two feet. They were so active that it was not without some difficulty that we succeeded in obtaining a specimen. Of this (as was our uniform custom when any apparently new animal was presented) we immediately drew out a description. But as the specimen was unfortunately lost, and the description formed part of the zoölogical notes and observations, which were carried off by our deserters, we are reduced to the necessity of merely indicating the probability of the existence of the *Chirote lumbricoides* of naturalists within the territory of

the United States.”—(Vol. i, p. 484.) As no mention is made as to whether the two feet observed were the anterior or posterior pair, it is possible that the animal here noticed might have been one of the *Scincidae*, which are also characterized by only one pair of feet, which are the posterior, however, instead of the anterior, as in *Chirotes*. Professor Cope does not include it in his “Check-list of North American Batrachia and Reptilia”, which embraces the reptilian fauna of Lower California.

CROTALIDÆ.

CROTALUS PYRRHUS, Cope [No. 8562].

Crotalus pyrrhus, COPE, Check-list, 1875, 33.

Caudisoma pyrrha, COPE, Proc. Acad. Nat. Sci. Phila., 1866, 308, 310—COUES, Wheeler's Geographical and Geological Explorations and Surveys West of the 100th Meridian, vol. v, 1875, Zoölogy, 608, pl. xxii.

Locality: Angel Island, Gulf of California. This is the first notice of the occurrence of this rare and interesting rattlesnake since the date of its original description by Professor Cope, in 1866, and, as far as I am able to discover, it is the second specimen in existence in any museum.* It is readily distinguishable from all other members of the family, except *C. mitchelli*, by the presence of scales between the prenasals and the rostral; and from the latter by the greater subdivision of the plates of the head—*C. mitchelli* having but one loreal, whilst in *pyrrhus* there are four.

The general style of coloration is much the same as given in the description and plate (Wheeler's Report), except that the colors in the recent specimen have somewhat faded in alcohol. The ground-color is a pinkish-gray instead of a salmon color. An exact tint, however, cannot be a point of much specific importance in reptiles, as they are known to be susceptible of a certain range of variation in their colors, in order to harmonize with the color of the ground on which they happen to be lying. The markings along the back are reddish-bay. These markings consist of a dorsal row of large hexagonal spots and a lateral row of smaller spots opposite the dorsal patches. On the anterior third of the length of the body, the hexagons are small and regular in outline, and are separated from the lateral spots by a well-defined interspace; on the middle third, they become more transverse, the lateral angles coa-

* Since the above was written, the head of a third specimen has been found in the reserve series of the National Museum.

lescing with the row on the sides ; and, on the posterior third of the length, all the markings have run together completely, being transformed into regular transverse bands. Three black half-rings on the tail. Some of the scales of the rows surrounding the dorsal patches are black-tipped. There is a heightening of the ground-color on the sides in the intervals between the lateral spots, corresponding to what Professor Cope describes as vermilion-colored spots. The bright lemon-colored spots in the same region have disappeared. The total length of the snake is $3\frac{1}{2}$ feet.

CROTALUS ADAMANTEUS ATROX, Cope [No. 8564].

Crotalus adamanteus atrox, COPE, Check-list, 1875, 33.

Crotalus atrox, BD. & GIR., Cat. N. Amer. Rept., 1853, 5, 156.—BD., P. R. R. Rep., x, 1859, Whipple's Route, Reptiles, 39, pl. 24, f. 3 ; U. S. and Mex. Bound. Surv. ii, pt. ii, 1859, Reptiles, 14, pl. i.

Caudisoma atrox, COPE, Mitchell's Res., 1861, 121 ; Proc. Acad. Nat. Sci. Phila., 1863, 309.

Caudisoma adomantea atrox, COUES, Wheeler's Geographical and Geological Explorations and Surveys West of the 100th Meridian, vol. v, Zoölogy, 1875, 607.

Locality: Los Coronados Islands, Pacific coast of Lower California.

ELAPIDÆ.

ELAPS EURYXANTHUS, Kennicott [No. 8566.]

Elaps euryxanthus, KENNICOTT, Proc. Acad. Nat. Sci. Phila., 1860, 337.—COPE, Proc. Acad. Nat. Sci. Phila., 1866, 307 ; Check-list, 1875, 34.—COUES, Wheeler's Geographical and Geological Explorations and Surveys West of the 100th Meridian, vol. v, 1875, Zoölogy, 611.

Locality: Tiburon Island, Gulf of California.

COLUBRIDÆ.

PITYOPHIS SAYI BELLONA, Cope [No. 8565].

Pityophis sayi bellona, COPE, Check-list, 1875, 39.—COUES, Wheeler's Geographical and Geological Explorations and Surveys West of the 100th Meridian, vol. v, 1875, Zoölogy, 617.

Churchillia bellona, BD. & GIR., Stansbury's Rep. Exp. Great Salt Lake, 1852, 350.

Pityophis affinis, HALLOW., Proc. Acad. Nat. Sci. Phila., 1852, 181 ; Sitgreaves's Exped. Zuñi & Colorado Riv., 1853, 130, 146, pl. 10.

Pityophis bellona, BD. & GIR., Cat. N. Amer. Rept., 1853, 66, 157.—KENN., *apud* BD., P. R. R. Rep., x, 1859, Williamson's Route, Reptiles, 42.—BD., P. R. R. Rep., x, 1859, Beckwith's Route, Reptiles, 19.—KENN., *apud* BD., U. S. & Mex. Bound. Surv., ii, pt. ii, 1859, Reptiles, 19.—COPE, Proc. Acad. Nat. Sci. Phila., 1866, 305.—ALLEN, Proc. Boston Soc. Nat. Hist., xvii, 1874, 69.

Locality: Saint Martin's Island, Pacific coast of Lower California. In our specimen, there is but one anterior orbital on a side; postorbitals three. On the left side, there are two prefrontals; the adventitious one is quite small, and is situated at the inner edge of the larger and normal prefrontal plate of the same side, between the rostral and the left internal postfrontal. Nine superior labials on each side, the eye resting on the fifth. In those cases where there are but eight labials on a side, the eye always rests on the fourth, and invariably on the fifth when nine plates are present. The additional plate is inserted anterior to the position of the eye; and in those cases the head is more elongate.

The whole of this small collection of reptiles, with two exceptions, came from the outlying islands along the coasts of the peninsula of Lower California. They can be arranged into two groups, representing, one the Pacific, and the other the gulf islands, accordingly as they are related to the two regions north of them; namely, the Pacific and Sonoran:

I. Types purely Sonoran, including all those that came from the gulf region:

Phrynosoma hernandesi.

Sauromalus ater.

Crotalus pyrrhus.

Elaps euryxanthus.

II. Types purely Pacific, or species belonging as well to the Pacific as to the Sonoran region, including all those that came from the Pacific coast:

Hyla regilla.

Uta stansburiana.

Crotalus adamanteus atrox.

Pityophis sayi bellona.

I desire especially to direct attention to the occurrence on Angel Island of two highly characteristic Arizonian reptiles, the *Sauromalus ater* and *Crotalus pyrrhus*. These have heretofore been confined to Arizona, and they are by no means common there. The naturalists of Wheeler's Survey have explored the Southwestern Territories for three successive

seasons, and have failed to add a single specimen of either to their collections. Their presence on Angel Island, which is situated in the gulf about midway its length, may be readily explained when we consider the geological changes that have taken place since the post-tertiary period. The study of the geological formation of all the outlying islands of the peninsula, both in the gulf and on the Pacific coast, convinced me that they were at one time portions of the mainland; the study of their fauna strengthens this conclusion. Fringing the mainland, and overlying the other formations on the islands, is a deposit of post-tertiary origin. There was an extensive upheaval during that period, and then it was that the islands probably formed a part of the peninsula, subsidence taking place subsequently. So far has this depression gone on—and it is probably going on at present—that some of the islands are now separated from the mainland by water a thousand feet deep. If we carry ourselves back to the time when they formed a part of the mainland, we will have the mouth of the Colorado River discharging its water into the gulf somewhere about the present site of Angel Island. So that it is not difficult to account for the presence of these reptiles on this now isolated bit of land, which was then connected with the Arizonian region by a continuity of surface.

ICHTHYOLOGY.

I.—Fishes of Upper and Lower California.

DIODONTIDÆ.

DIODON MACULATUS, Lacép. [No. 17540].

Diodon tacheté, LACÉP., Poiss., ii, 1801, p. 13.

Diodon novemmaculatus, CUV., Mém. Mus. Hist. Nat., iv, 1818, 136, pl. 6.—BLEEK., Nat. Tyds. Ned. Ind., iii, 1852, 567.

Diodon sexmaculatus, CUV., op. cit., iv, 1818, 136, pl. 7.—KAUP, Arch. Naturgesch., xxi, i, 1855, 229.

Diodon multimaculatus, CUV., op. cit., iv, 1818, 136, pl. —KAUP, op. cit., xxi, i, 1855, 227.

Diodon quadrimaculatus, CUV., op. cit., iv, 1818, 137, pl. 6.—BLEEK., Act. Soc. Sc. Indo-Neerl., ii, Amboina, viii, 94.

Diodon spinosissimus, KAUP, Arch. Naturgesch., xxi, i, 1855, 228 (not Cuvier).

Paradiodon novemmaculatus, BLEEK., Atl. Ichth., v, 1865, 57, pl. 206; *Gymnod.*, pl. 2, f. 3.

Paradiodon quadrimaculatus, BLEEK., Atl. Ichth., v, 1865, 58, pl. 212; *Gymnod.*, pl. 8, f. 2.

Diodon maculatus, GÜNTHER, Cat. Fishes, viii, 1870, 307.

Locality: Lower California.

Our species corresponds to var. *a* of Günther. It presents some points of difference, which we will note. The frontal row of spines the longest; nearly all the spines of the back and sides are longer than the diameter of the eye. The black band between the eyes does not extend completely across the interorbital space, but is interrupted in the center; it extends downward behind the eyes. The color is distributed over the rest of the body as follows:—A vertical band beneath the eye; a broad band across the nape of the neck; a large round spot on either side above and behind the base of the pectoral fin; a large triangular spot, with apex truncated, in the middle of the back; a V-shaped spot more posteriorly, diverging anteriorly, and with the base of the dorsal fin situated in the angle. Besides these, there are a number of small round spots scattered over the back and sides, one of which, larger than the rest, on the side, is situated behind and on a line with the inferior edge of the pectoral fin.

Length, 6 inches.

COTTIDÆ.

LEPTOCOTTUS ARMATUS, *Gir.* [No. 12963].

Leptocottus armatus, GIRARD, Proc. Acad. Nat. Sci. Phila., vii, 1854, 131-145; viii, 1856, 133; P. R. R. Report, x, 1858, Fishes, 60, pl. 15, f. 2.

Acanthocottus inermis, AYRES.

Centridermichthys armatus, GÜNTHER, Cat. Fishes, ii, 1860, 171.

Locality: Mare Island, Cal.

Günther queries Girard's statement that the end of the upper maxillary bone extends beyond the vertical from the posterior margin of the orbit. In our six specimens from Mare Island, varying in length from 3.50 to 5 inches, it reaches in every example either to or beyond the vertical from the posterior margin of the orbit. We find nothing wanting to complete Girard's excellent description of this fish.

SCORPÆNIDÆ.

SEBASTOMUS AURICULATUS, (*Gir.*) *Gill* [No. 12964].

Sebastes auriculatus, GIRARD, Proc. Acad. Nat. Sci. Phila., 1854, 131; P. R. R. Report x, 1858, Fishes, p. 80.—AYRES, Proc. Cal. Acad. Nat. Sci., ii, 1853, 218, f. 68; Proc. Zoöl. Soc. London, 1863, 394, fig.

Sebastes ruber, var. *parvus*, AYRES, Proc. Cal. Acad. Nat. Sci., i, 1854, 7.

Sebastichthys auriculatus, GILL, Proc. Acad. Nat. Sci. Phila., 1862, 278.

Sebastomus auriculatus, GILL, MSS.

Locality: San Francisco, Cal. Caught at the wharves of Mission Bay.

LABRIDÆ.

PIMELOMETOPON PULCHER, (*Ayres*) *Gill* [No. 17551].

Labrus pulcher, AYRES, Proc. Cal. Acad. Nat. Sci., i, 1854, v. 3; Proc. Boston Soc. Nat. Hist., v, 1854, 101.

Semicossysphus pulcher, GÜNTHER, Ann. and Mag. Nat. Hist., series iii, viii, 1861, 384; Cat. Fishes, iv, 1862, 99.—GILL, Proc. Acad. Nat. Sci. Phila., 1863, 330.

Pimelometopon pulcher, GILL, Proc. Acad. Nat. Sci. Phila., 1864, 58.

Locality: Pacific coast of Lower California.

D. $\frac{12}{10}$. A. $\frac{3}{12}$. L. lat. 58.

Height of the body equals the length of the head, and is contained not quite four times in the total length. Height of the head equals its length. But three large anterior canine teeth in each jaw (probably

an abnormal number); posterior canine present in the upper jaw. The superior maxillary does not reach to the vertical from the anterior margin of the orbit. Caudal fin deeply concave behind, angles produced. The anterior portion of the body from behind the gill-opening to a line drawn vertically from the commencement of the soft dorsal to the anal fin reddish (in alcohol); posteriorly blackish-brown; head blackish-brown, except lower jaw and chin, which are reddish-white. (Ayres states the chin to be white in life.) The color on the chin extends backward to a line drawn obliquely downward from the angle of the mouth. A light-colored vertical band on the posterior margin of the caudal; posterior extremities of soft dorsal and anal lighter colored.

Total length, 27 inches; height of the body at its greatest elevation, 7 inches.

EMBIOTOCIDÆ.

CYMATOGASTER AGGREGATUS, *Gib.* [No. 12966].

Micrometrus aggregatus, GIBBONS, Proc. Acad. Nat. Sci. Phila., vii, 1854, 125.—A. AGASSIZ, Proc. Boston Soc. Nat. Hist., 1861, 128.

Cymatogaster aggregatus, GIBBONS, Proc. Acad. Nat. Sci. Phila., vii, 1854, 106.—GILL, Proc. Acad. Nat. Sci. Phila., 1862, p. 275 (foot-note).

Holconotus rhodoterus, GIRARD, Proc. Acad. Nat. Sci. Phila., vii, 1854, 141, 152; 1855, 322; P. R. R. Report, x, 1858, 193, pls. 35 and 36, figs. 1-4; pl. 26, f. 7 and 8.—SUCKLEY, Nat. Hist. Wash. Terr., 1860, 358 (nec Agass.).

Metrogaster aggregatus, A. AGASSIZ, Proc. Boston Soc. Nat. Hist., 1861, 133.

Ditrema aggregatum, GÜNTHER, Cat. Fishes, iv, 1862, 248.

Locality: Mission Bay, San Francisco, Cal.

In Günther's Catalogue of Fishes, Vol. iv, p. 248, we find the following foot-note in reference to Girard's figure: "If the figure of pl. 36 has really been drawn from a specimen of this species, the control over the artist must have been very careless, the scales being represented much too small." The eminent authority whom we have just quoted evidently had the upper figure of the plate, *Amphistichus similis*, in which the scales are correctly represented small, in his mind's eye when he charged the American ichthyologist with being careless; otherwise, we cannot see how he made the mistake which he did. We can certify by actual measurements that the scales of *Holconotus rhodoterus*, the fish in question, are sufficiently accurately represented in figure 1, plate 36, and are of the same size as those of the figures on the preceding plate, concerning which the gentleman is silent, leaving us to infer that they are correct in that respect.

TRICHIURIDÆ.

TRICHIURUS LEPTURUS, Linn. [No. 17545].

- Trichiurus lepturus*, LINN., Syst. Nat., i, 1766, 429.—BL. SCHN., Syst. Ichth., 1801, 517.—CUV. & VAL., Hist. Nat. des Poiss., viii, 1831, 237.—YARRELL, British Fishes, i, 1841, 204.—STORER, Boston Jour. Nat. Hist. iv, 1844, 181.—CASTELN. Anim. nouv. ou rares Amer. Sud, 1855, 24.—DEKAY, Zool. New York, Fishes, 1842, 109, pl. 12, f. 35.—GUICHEN, Poiss. in ROMON DE LA SAGRA, Hist. Cuba, 1845, 105.—GÜNTHER, Cat. Fishes, ii, 1860, 346.
- Trichiurus argenteus*, SHAW, Zool., iv, 1803, 90, pl. 12.—MITCH., Trans. Lit. and Phil. Soc., New York, i, 1815, 364.
- Lepturus argenteus*, GILL, Proc. Acad. Nat. Sci., Phila., 1863, 226.

The height of the body, at the situation of the pectoral fin, is contained $17\frac{1}{2}$ in the total length, and the length of the head is 7 times in the same. The eye occupies half of the depth of the head; its diameter is slightly more than the interorbital space, and it is contained 6 times in the length of the head and $1\frac{4}{5}$ times in the length of the snout. The latter is $3\frac{1}{3}$ times in the head-length. Height of pectoral fin is $\frac{2}{3}$ of the height of the body, and is contained $26\frac{1}{4}$ times in total length; tail, from the extremity of the dorsal fin, $5\frac{5}{6}$ in the same, and from the last spine on the lower surface of the body, $10\frac{1}{2}$ times. Anus placed at the junction of the anterior and middle thirds of the length; behind anns are 98 small spines. Dorsal rays, 122; pectoral, 11. Lateral line below the middle of the body. Silvery, with a dark metallic luster along the back. Length, 10.50.

Locality: Mouth of the Colorado River, Gulf of California.

We do not hesitate to refer this species to the *Trichiurus lepturus* as it is illustrated by specimens coming from the Gulf of Mexico, which are found to have a relatively longer tail. Günther's statement that the diameter of the eye is contained three times in the length of the snout is an error, if applied to the Western Atlantic species. We have measured nine specimens, obtained from seven different localities on the Atlantic and Gulf coasts, and find it to vary from $1\frac{5}{7}$ to $2\frac{2}{3}$. In four specimens the snout was twice the diameter of the eye, in three it was more than twice, and in two it was less than that number. We have not been able to find any good specific characters for the different species of *Trichiurus*. The species are founded principally upon locality and the relative proportions of the different parts of the body; yet if all

those from the Atlantic be accepted as belonging to one species—*Lepturus*—we find there to be a considerable variation in their proportions. We subjoin tables to illustrate this variation, as well as to show the affinities of the species from the Gulf of California with those found in the Gulf of Mexico, and also the relations of *haumela* with specimens from the Caribbean Sea. The specimens of *haumela* from which the measurements were taken came from the Indian Ocean, through the British Museum. The proportions from Cuvier and Valenciennes are taken as the standard for comparison.

| | Lepturus. | | |
|-----------------------|----------------|------------------|-----------------|
| | C. & V. | New York. | Cuba. |
| Height in total | 16-17 | $16\frac{2}{11}$ | $16\frac{2}{3}$ |
| Head in total | 8 | $8\frac{1}{4}$ | $8\frac{1}{5}$ |
| Snout in head | $2\frac{2}{3}$ | 3 | — 3 |
| Eye in head | 6 | 6 | $6\frac{1}{4}$ |
| Eye in snout | $2\frac{1}{4}$ | 2 | $2\frac{5}{6}$ |
| Tail in total | 7 | 7 | 6 |

| | Lepturus. | | | |
|-----------------------|-------------------|-----------------|-----------------|-----------------|
| | Lower California. | Texas. | Florida. | Mississippi. |
| Height in total | $17\frac{1}{2}$ | $17\frac{2}{3}$ | $17\frac{3}{5}$ | $17\frac{1}{4}$ |
| Head in total | 7 | $7\frac{1}{2}$ | $7\frac{5}{9}$ | — 8 |
| Snout in head | $3\frac{1}{8}$ | + 3 | — 3 | — 3 |
| Eye in head | 6 | $5\frac{5}{7}$ | $5\frac{5}{6}$ | $5\frac{5}{6}$ |
| Eye in snout | $1\frac{4}{5}$ | $1\frac{7}{9}$ | 2 | 2 |
| Tail in total | $5\frac{5}{6}$ | 6 | 6 | $6\frac{9}{10}$ |

| | Haumela. | Lepturus. | |
|-----------------------|-----------------|----------------------|----------------------|
| | Indian Ocean. | Graytown, Nicaragua. | Graytown, Nicaragua. |
| Height in total | $15\frac{5}{9}$ | $15\frac{1}{7}$ | 15 |
| Head in total | 7 | $7\frac{2}{5}$ | $6\frac{4}{7}$ |
| Snout in head | $3\frac{1}{3}$ | + 3 | — 3 |
| Eye in head | $6\frac{3}{5}$ | $6\frac{4}{6}$ | 7 |
| Eye in snout | 2 | $2\frac{1}{5}$ | $2\frac{2}{3}$ |
| Tail in total | 7 | $9\frac{1}{11}$ | $8\frac{1}{2}$ |

LATILIDÆ.

CAULOLATILUS ANOMALUS, (*Cooper*) Gill [No. 17553].

Dekaya anomala, COOPER, Proc. Calif. Acad. Nat. Sci., iii, 1864, 70, f. 17.

Caulolatilus anomalus, GILL, Proc. Acad. Nat. Sci. Phila., 1865, 68.

$$D. \frac{9}{25}. \quad A. \frac{2}{24}.$$

Greatest height of the body is contained $4\frac{1}{3}$ times in the total length, and the length of the head $4\frac{2}{3}$ in the same. The diameter of the eye is one-fifth of the length of the head, and the length of the snout one-third. The dorsal fin commences above the root of the pectoral, and extends to within a short distance of the caudal fin; its length is slightly more than one-half the total length; first dorsal spine the shortest—one-nineteenth of the total length of the fin; the longest spine between one-seventh and one-eighth; the longest soft ray between one-fifth and one-sixth; and the last ray about one-fifteenth of the length of the fin. The anal fin commences under the fourth soft dorsal ray, and terminates opposite the end of the dorsal; its length three-fifths of the length of the dorsal; its height one-fourth of its length. Pectoral long and pointed, somewhat shorter than the head; the middle ray the longest. Ventrals commence under the hinder margin of the base of the pectoral, and are contained $1\frac{2}{3}$ times in the length of the latter. Caudal peduncle is $12\frac{1}{2}$ times in the total length; its height about one-fourth of the greatest height of the body. Caudal fin about $6\frac{1}{2}$ times in the total length. Total length 18.50 inches.

Locality: Lower California.

SCIÆNIDÆ.

CYNOSCION SQUAMIPINNIS, (*Gthr.*) Streets [No. 17552].

Otolithus squamipinnis GÜNTHER, Proc. Zool. Soc. London, 1866, 601; Trans. Zool. Soc. London, vi, 1869, 429.

$$D. 9-10\frac{1}{25}. \quad A. \frac{2}{16}.$$

Our specimens agree with Günther's description in every particular, except in the number of soft rays in the dorsal fin. The measurements are identical, as are also the arrangement of the scales and color. What is very characteristic of this fish is the condition of the dorsal and anal fins. It is the only species of this genus in which these fins

are completely covered with scales. Our two specimens measure 25 and 26 inches in length.

Locality: Gulf of California, off the San Ignacio River, Sonora. We found them very abundant at this locality.

PRISTIPOMATIDÆ.

HÆMULON FLAVIGUTTATUM, Gill [No. 17543].

Hæmulon flaviguttatus, GILL, Proc. Acad. Nat. Sci. Phila., 1862, 254.—STEINDACHNER, Sitzb. Akad. d. Wiss., lxxii, 1875, Ichthyologische Beiträge, iii, 14.

Hæmulon margaritifera, GÜNTHER, Trans. Zool. Soc. London, vi, 1869, 419, pl. 65, f. 2.

D. $12\frac{1}{15}$. A. $\frac{3}{10}$. L. lat. 53 to the caudal fin; 61 to its termination on the caudal fin. L. trans. $\frac{8}{15}$.

The measurements of our specimen agree with Professor Gill's, except in the lengths of the eleventh, twelfth, and thirteenth dorsal spines, which are subequal and shorter than the second spine. Total length 12 inches.

Locality: Lower California.

XENICHTHYS CALIFORNIENSIS, Stein. [No. 17541].

Xenichthys californiensis, STEINDACHNER, Sitzsber. Ak. Wiss. Munich, lxxii, 1875. Ichthyologische Beiträge, iii, p. 3.

We arrive at a positive identity of our species by comparison with Dr. Steindachner's excellent description. We may add, however, that the longitudinal bands above the lateral line are much more distinctly defined and of a darker color than those below. The upper are blackish-brown, and there are some irregular markings between them. There are always three bands above the lateral line; while those below may vary from four to five. The whole surface of the body, except the under parts, is covered with minute brown points.

Locality: Cerros Island, Pacific coast of Lower California.

PRISTIPOMA LEUCISCUS, Gthr. [No. 17539].

Pristipoma leuciscus, GÜNTHER, Proc. Zool. Soc., 1864, 147; Trans. Zool. Soc., vi, 1869, 416, pl. 56, f. 3.

D. $11\frac{1}{14-16}$. A. $\frac{3}{8}$. L. lat. 51. L. trans. $\frac{5-6}{10}$.

Darker above the lateral line than below. A black spot posteriorly in the axil of the pectoral fin. A dark longitudinal line, rather indistinct, corresponding to the center of each row of scales on the sides. The fins, and the scales on the sides and breast, dotted with minute points of Bull. N. M. No. 7—4

black. We add these notes in regard to the color, for the reason that they are not mentioned in Günther's description, although they are represented in his figure.

Length of specimens 9.8 and 6.5 inches.

Locality: Lower California.

CONODON PLUMIERI, (*Bloch*) *Gthr.* [No. 17546].

Sciæna plumieri, BLOCH, *Naturg. der ausländ. Fische*, vi, 1785, 66, pl. 306.

Sciæna coro, BLOCH, *Naturg. der ausländ. Fische*, 1785, pl. 307, f. 2.—BLOCH, *Syst. Ichth.* ed. SCHN., 1801, 81.

Percæ plumieri, BLOCH, *Syst. Ichth.* ed. SCHN., 1801, 85.—CUV. & VAL., *Hist. Nat. des Poiss.*, ii., 1828, 57.

Centropomus plumieri, LACÉP., *Hist. des Poiss.*, iv, 1803, 268.

Chilodipterus chrysopterus, LACÉP., *op. cit.*, iii. 1803, 542, pl. 33, f. 1.

Conodon antillanus, CUV. & VAL., *op. cit.*, v, 1830, 156.

Pristipoma coro, CUV. & VAL., *op. cit.*, 1830, v, 266.—CUV., *Règne Anim.* Ill. Poiss., 1829-30, pl. 30, f. 2.—GÜNTHER, *Cat. Fishes*, i, 1859, 297.

Conodon plumieri, GÜNTHER, *Cat. Fishes*, i, 1859, 304.—TROSCHEL, *In MÜLLER, Wirbelth. Mex.*, 91.

The height of the body is one-fourth of the total length, and the length of the head is contained $3\frac{2}{3}$ times in the same. The diameter of the eye is exactly one-fourth of the length of the head; the snout is somewhat longer. The lower jaw projecting in advance of the upper; the extremity of the upper maxillary bone extending slightly beyond the vertical from the anterior margin of the orbit. An external row of short, stout, conical teeth, the four or six anterior in each jaw larger and longer than those on the sides; behind the external row a band of villous teeth. Both limbs of the præoperculum armed with distant, sharp, spinous teeth; those on the posterior limb directed upward, while those on the horizontal limb are directed forward; at the angle of the two borders is one long and stout spine, directed backward and projecting considerably beyond the posterior border; posterior border slightly concave. Angle of the operculum obtuse. The dorsal fin deeply notched; the fourth spine being the longest, about equaling half the length of the head; first and second dorsal spines short. The second anal spine is very stout and striated, and of the same length as the fourth dorsal. Pectoral pointed, the sixth ray being the longest, about one-fifth of the total length. Ventrals inserted behind the pectorals, shorter than the latter and do not extend as far backward.

All the specimens obtained gave the following formula :

D. $11\frac{1}{2}$. A. $\frac{3}{7}$. L. lat. 50-51. L. trans. $\frac{5}{13}$.

Body silvery, darker above the lateral line, sides with eight vertical bars of dark brown descending from the dorsum to about the middle of the height of the body. The first descends from the nape of the neck; three begin along the base of the spinous dorsal; two from the soft dorsal; and two on the caudal peduncle.

We cannot distinguish this fish from the *Pristipoma coro* and *Conodon antillanus* of Cuvier and Valenciennes. It agrees with them in every essential particular. It will be observed, however, that the above description differs from Günther's in the following particulars:—The height of the body is one-fourth of the total length, instead of being contained in it $3\frac{1}{2}$ times; the posterior limb of the præoperculum is slightly concave, instead of descending obliquely backward; and, finally, there is but one strong spinous projection at the angle, instead of two. Cuvier in none of his descriptions mentions more than one strong spinous tooth at the angle.

Lengths 8, 7.25, 6.80 inches.

Locality: Boca Solidad, Pacific coast of Lower California.

SERRANIDÆ.

EPINEPHELUS ROSACEUS, *Streets*, n. sp. [No. 17554].

D. $\frac{11}{17}$. A. $\frac{3}{11}$. P. 16. V. $\frac{1}{5}$.

Height of the body somewhat less than the length of the head, and about $3\frac{2}{3}$ times in the total length, including the caudal fin; without caudal, three times. Length of the head is contained about $3\frac{1}{6}$ times in the total length, including caudal, and $2\frac{2}{3}$ without caudal. Dorsal outline arched, and the front descends in a nearly straight line from the commencement of the dorsal fin to the point of the snout. The length of the snout more than twice the diameter of the eye; and the latter is contained seven times in the length of the head. The interorbital space convex, and much broader than the diameter of the eye. Cleft of the mouth slightly oblique; lower jaw projecting; the end of the upper maxillary reaches to the vertical from the middle of the eye. Two or three large canine teeth in each jaw anteriorly, those in the lower jaw slightly smaller; an external lateral row of canines in each jaw. On the sides an internal series of movable teeth; on the lower jaw in front

there is a short villiform band between the canines and movable teeth; on the upper jaw the movable teeth are intermediate between the canines and villiform band. Teeth on the vomer and palatines; on the first-named forming a triangular band. The præoperculum slightly notched above the angle; the posterior margin and angle finely serrated; the inferior border as well as the free margins of the sub- and interoperculum smooth. The membranous border of the operculum produced behind the spines to an acute point; the middle of the three spines the largest, and placed nearer the lower than the upper spine of the border. The dorsal fin commences directly above the base of the pectoral; the third and fourth spines are the longest, but shorter than the posterior rays of the soft dorsal; first spine about one-half the length of the second. Spinous portion of the fin lower than the soft; the posterior rays of the latter the longest. Anal commences about under the sixth soft dorsal ray, and ends before the termination of the dorsal; the first spine very short, the second more than one-half the length of the third; the anterior rays prolonged, the fifth and sixth the longest; the posterior border emarginate. Pectorals rounded posteriorly, about one-half the length of the head, a large fleshy flap in the superior axil. Ventrals somewhat shorter than the pectorals, and commence just behind their base, and do not extend to the vent. Caudal slightly emarginate, and constitutes about one-fifth of the total length of the body.

Color (in life) uniformly rosaceous; (in alcohol) golden-yellow.

Total length, 20.50 inches; height, 5.50; head, 6.50.

Locality: Gulf of California, in the vicinity of Angel Island.

DIPLECTRUM RADIALIS, (Q. & G.) Streets [No. 17550].

Serranus radialis, QUOY & GAIMARD, Voy de Freyc, Poiss., 1824, 316.—CUV. & VAL. Hist. Nat. des Poiss., ii, 1828, p. 243.

Centropristis radialis, GÜNTHER, Cat. Fishes, i, 1859, 83.—STEINDACHNER, Sitzb. der K. Akad. der Wiss., lxxii, 1875, Ichthyologische Beiträge, iv, 6.

Centropristis ayresi, STEINDACHNER, Sitzb. d. K. Akad. d. Wiss., lvii, 1868, Ichthyologische Notizen., vii, 1, pl. 1, f. 1.

Centropristis macropomus, GÜNTHER, Trans. Zoöl. Soc. London, vi, 1869, 409, pl. 65, f. 1.

D. $\frac{10}{13}$. A. $\frac{3}{7}$. L. lat. 50. L. trans. $\frac{6}{16}$.

Angle of the præoperculum enlarged, rounded, striated, and armed with strong spines; those of the right side showing a tendency to separate into two fasciculi, as in *D. fascicularis*; a notch above the angle; the posterior margin oblique and finely serrated; the inferior border serrated,

and the stout spines from the angle extend further along on this border than up the posterior, and the gradation is less abrupt; nine series of scales between the eye and the angle of the præoperculum. The end of the upper maxillary reaches nearly or quite to the vertical from the posterior margin of the orbit. Dorsal fin with a notch; the ninth spine being exactly the same length as the tenth.

The colors on the side of the body have somewhat the same arrangement as is observed in *C. radians*. There are eight transverse streaks between the angle of the operculum and the base of the caudal fin, and these are crossed along their middle by a longitudinal band. All these markings are more or less indistinct. An irregular black blotch at the base of the caudal fin. Soft dorsal and caudal spotted. Ground color yellowish.

Total length, 9.50 inches; length of the head contained $3\frac{1}{2}$ times in the total length; the greatest height of the body is a little more than one-quarter of the total length.

Locality: Bay of La Paz, Lower California.

The only characters that are peculiar to the species described by Günther are the six rows of scales between the eye and the angle of the præoperculum, and the longer tenth spine of the spinous dorsal. These are of extremely doubtful importance to found a new species upon, inasmuch as the species is recognized as subject to local or individual variation.

ECHENEIDIDÆ.

ECHENEIS REMORA, LINN. [No. 17547].

Echeneis remora, LINN., Syst. Nat., i, 1766, 446; Amœn. Acad., i, 1749, 320, and Mus. Reg. Ad. Fred., i, 1754, 75.—OSBECK, Voy. China, 1771, 94.—SCHÆPFT, Schrift. Gesellsch. Naturg. Freunde, Berlin, viii, 3, 145.—BL., Naturg. der ausländ. Fische, ii, 1785, 134, pl. 172.—BL., Syst. Ichth., ed. SCHN., 1801, 240.—LACÉP., Hist. des. Poiss., iii, 1803, 146, 147, pl. 9, f. 1.—CUV., Règne Anim., 1817.—BLUMENB., Abbild., 1810, pl. 78.—RISSE, Ichth., Nice, 1810, 177; Enr. Merid., iii, 1827, 269.—SHAW, Zool., iv, 1803, 202, pl. 31.—MÜLLER, Prodr. Faun. Dan., 1777, no. 361.—MITCH., Trans. Lit. & Phil. Soc. New York, i, 1815, 378.—TURTON, Brit. Faun., 94.—RICHARDS, Faun. Bor. Amer., 1836, 265.—FABER, Fische Islands, 115.—SCHLEG., Faun. Japon. Poiss., 1859, 271.—DEKAY, Zool., New York, Fishes, 1842, 309.—LOWE, Trans. Zool. Soc. London, iii, 16.—BENN., Whaling Voy., 271.—JENYNS, Zool., Beagle, Fishes, 1842, 142.—YARRELL, Brit. Fishes, i, 3d edit., 1859, 670.—GÜNTHER, Ann. & Mag. Nat. Hist., 1860, 390; Cat. Fishes, ii, 1860, 378; Jour. Mus. Godeff. Heft., xi, 1876, Fische der Sudsee, Heft., v, 156.—GILL, Proc. Acad. Nat. Sci. Phila., 1864, 60.

Echeneis naucrates, RISSO., Eur. Merid., iii, 1827, 270.

Echeneis Jacobaea, LOWE, Proc. Zool. Soc. London, 1839, p. 89; Trans. Zool. Soc. London, iii, 17.

Echeneis pallida, LOWE, op. cit., 1839, 89; op. cit., iii, 16, (nec Schleg.).

Echeneis romoroides, BLEEK., Nat. Tyds. Ned. Ind., ii, 1855, Bate, 70.

Echeneis parra, GRONOV., (1780), Syst. ed., Gray, 1854, p. 92.

Remora Jacobaea, GILL, Proc. Acad. Nat. Sci., Phila., 1862, 240; 1863, 88.

Locality: Bay of La Paz, Lower California.

This, along with the following species, was found on the body of a large sea-devil (*Ceratoptera*), caught in the Gulf of California.

ECHENEIS ALBESCENS, Schleg. [No. 17544.]

Echeneis albescens, SCHLEG. Faun. Japon., Poiss., 1850, 272, 120, f. 3.—GÜNTHER, Cat. Fishes, ii, 1860, 377; Jour. Mus. Godeff. Heft., xi, 1876, Fische der Sudsee, Heft., v, 155.—BLEEKER, Act. Soc. Sc. Indo-Nederl., vi; New Guinea, 20.

Number of laminae in the disk 13–14. D. 21. A. 21. The length of the disk is contained $3\frac{1}{2}$ to $3\frac{1}{2}$ times in the total length; the width between the pectorals is contained $5\frac{1}{3}$ to $5\frac{1}{10}$ times in the same. The angle of the mouth is situated in the vertical from the third lamina of the disk. The length of ventral fin equals the distance between the root of the pectoral and the posterior margin of the eye.

Lengths 7.40; 5.10 inches.

Locality: Bay of La Paz, Lower California.

ENGRAULIDIDÆ.

ENGRAULIS RINGENS, Jenyns [No. 12965].

Engraulis ringens, JENYNS, Voy. Beagle, Fish., 1842, 136.—CUV. & VAL., Hist. Nat. des Poiss., xxi, 1848, 27.—GÜNTHER, Cat. Fishes, vii, 1868, 386.

Engraulis mordax, GIRARD, Proc. Acad. Nat. Sci. Phila., 1854, 128, 154; P. R. R. Rep. x, Fishes, 1858, 334.

Engraulis pulchellus, GIRARD, Proc. Acad. Nat. Sci. Phila., 1854, 199; U. S. Naval Astron. Exped., Zool., Fishes, 247, pl. 31, f. 5–9.

Engraulis nasus, KNER & STEINDACHNER, Sitzb. d. k. Ak. Wiss. Wien, liv, 1866, 388, f. 17.

Locality: Mare Island, California.

SILURIDÆ.

ÆLURICHTHYS PANAMENSIS, Gill [Nos. 17548, 17549].

Ælurichthys panameusis, GILL, Proc. Acad. Nat. Sci. Phila., 1863, 172.—GÜNTHER, Cat. Fishes, v, 1864, 179; Trans. Zoöl. Soc. London, vi, 1869, 476.—STEINDACHNER, Sitzb. d. k. Akad. d. Wiss. Wien, lxxii, 1875, Ichthyologische Beiträge, iv, 14.

Ælurichthys nuchalis, GÜNTHER, Trans. Zoöl. Soc. London, vi, 1869, 476, pl. 81, f. 2; Cat. Fish., v, 1864, 179.

Locality: Pacific coast of Lower California; a special locality, Boca Solidad.

OPHICHTHYIDÆ.

OPHICHTHYS TRISERIALIS, (Kaup) Gthr. [No. 17542].

Ophichthys triserialis, GÜNTHER, Cat. Fishes, viii, 1870, 58.

Muranopsis triserialis, KAUP., Apod. Fish., 1856, 12.

Herpetoichthys collisoma, ABBOTT, Proc. Acad. Nat. Sci. Phila., 1860, 475.

Ophisurus californiensis, GARRETT, Proc. Calif. Acad. Nat. Sci., iii, 1867, 66.

Locality: Lower California.

Günther states that there are one or two series of smaller brown spots along the abdomen. We obtained two specimens of this fish, and neither shows any brown spots on the abdomen. In every other respect they agree with Abbott's description.

RHINOBATIDÆ.

RHINOBATUS PRODUCTUS, Ayres [No. 18352].

Rhinobatus productus (AYRES, MSS.), GIRARD, Proc. Acad. Nat. Sci. Phila., 1854, 196; U. S. P. R. R. Rep., x, 1858, part iv, 370.

Rhinobatus leucorhynchus, GÜNTHER, Proc. Zoöl. Soc. London, 1866, 604; Trans. Zoöl. Soc. London, 1868, 490; Cat. Fish., viii, 1870, 444 (fig. of snout).

Female.—The anterior nasal valve is dilated into a very narrow lateral fold, scarcely projecting beyond the nasal margin. The length of the nostril is slightly more than its distance from the lateral margin of the head, and more than the distance between the inner angles of the nostrils, and much less than the width of the mouth, which is very slightly arched. Snout produced, the distance between the outer angles of the nostrils being three-fifths of that between the mouth and the end of the snout. A series of small, depressed, polished spines along the median ridge of the back; groups of small polished tubercles on the

orbital margin and on the shoulder. A broad groove between the rostral ridges, which are separated along their entire length. Snout lighter colored than the rest of the body.

Length, 50 inches.

Locality: St. Bartholomé Bay, Lower California.

We have examined Girard's type in the National Museum, and have determined it to be identical with *leucorhynchus* of Günther. The "blackish band along the middle of the back, with diffused blotches upon the sides and a double band of the same color along the middle of the snout" are not discernible. The coloration is uniform, except the light-colored snout.

II.—*Fishes of the Hawaiian Group.*

TETRODONTIDÆ.

TETRODON IMPLUTUS, Jenyns [No. 17997].

Tetodon implutus, JENYNS, Voy. Beagle, Fish., 1842, 152.

Tetraodon laterna, RICHARDSON, Voy. Sulphur, Zool., 1844, 124, pl. 61, f. 2; Rep. Ichth. Chin., Rep. 15th Meet. Brit. Assoc., 1846, 199.—BLEEKER, Verh. Bat. Gen., xxiv, 1852, Blootk. visseh., 23; Nat. Tyds. Ned. Ind., iii, 1852, Bydrage Ichth. Mo-luksch. eil., 299.—GÜNTHER, Fish. Zanz., 1866, p. 131.

Arothron laterna, BLEEKER, Enum. Pisc. Arch. Ind., 1859, 200.

Crayracion implutus, BLEEKER, Atl. Ichth., 1865, *Gymnod.*, p. 71.

Crayracion laterna, BLEEKER, Atl. Ichth., 1865, pl. 205, *Gymnod.*, pl. 1, f. 3.

Tetodon hispidus, GÜNTHER, Cat. Fish., viii, 1870, 297 (in part—var. β , 298).

Locality: Honolulu Harbor, Oahu.

Specimens small, under surface of the body densely covered with short spines; the longitudinal lines on the abdomen distinct, and the round, bluish-white spots on the dorsal region are few in number. Specimens of this fish from the Fanning group show some slight differences, which will be pointed out in the account of the collection from that locality.

BALISTIDÆ.

BALISTES BUNIVA, (Lacép.) Gthr. [No. 18001].

Balistes ringens, OSBECK, Voy. Chin., ii, 1771, 93.—BLOCH, Ausl. Fisch., 1785, pl. 152, f. 2.—BLOCH, Syst. Ichth., ed. SCHN., 1801, 472.—LACÉP., Hist. des Poiss., i, 1793, 370, pl. 18, f. 1.—RICHARDSON, Voy. Samar., Fish., 1848, 21, pl. 16, f. 1-4; Rep. Ichth. Chin., Rep. 15th Meet. Brit. Assoc. 1846, 201.—HOLLARD, Ann. Sc. Nat., 4th series, 1854, Zool. i, 317.—BLEEKER, Act. Soc. Sc. Ind. Néerl., viii, 1860; Sumatra, viii, 69 (nec Linn.).

Baliste buniva, LACÉP., op. cit., v, 1803, 669, pl. 21, f. 1.

Balistes piccus, POEY, Proc. Acad. Nat. Sci. Phila., 1863, 180; Repert. Fis.-Nat., Cuba, ii, 1868, 435.

Melichthys ringens, BLEEKER, Atl. Ichth., v, 1865, 108, pl. 220, f. 2; *Balist.*, pl. vi, f. 2.

Balistes niger, GÜNTHER, Fish. Zanz., 1866, 135, pl. 19, f. 1.

Balistes buniva, GÜNTHER, Cat. Fish., viii, 1870, 227.

Locality: Honolulu, Oahu.

BALISTES VIDUA, *Richards*. [No. 17984].

Balistes vidua, RICHARDSON, Voy. Sulphur, Fish., 1844, 128, pl. 59, f. 9-10.—BLEEKER, Nat. Tyds. Ned. Ind., iii, 1852, Amboina, ii, 565.—HOLLARD, Ann. Sc. Nat., 1854, 4th series, Zoöl. i, 319.—GÜNTHER, Cat. Fish., viii, 1870, 216.

Melichthys vidua, BLEEKER, Atl. Ichth., v, 1865, 109, pl. 217, f. 2; *Balist.*, pl. iii, f. 2.

Locality: Honolulu Harbor, Oahu.

PLEURONECTIDÆ.

RHOMBOIDICHTHYS PANTHERINUS, (*Rüpp.*) *Gthr.*, 1798, [Nos. 17979, 17981].

Rhombus pantherinus, RÜPPELL, Atl. Fisch., 1828, 121, pl. 31, f. 1.—BLEEKER, Nat. Tyds. Ned. Ind., viii, 1855, Kokos-eil., iii, 178.

Rhombus paraimanus, BENNETT, Proc. Comm. Zoöl. Soc., i, 168.

Rhombus sumatranus, BLEEKER, Verh. Bat. Gen., xxi, 1852, *Pleuron.*, 14.

Rhomboidichthys pantherinus, GÜNTHER, Cat. Fish., iv, 1862, 436.—KLUNZ., Verh. z.-b. Ges. Wien, xxi, 1871, 571.

Locality: Honolulu Harbor, Oahu. Very abundant.

GOBIIDÆ.

CULIUS FUSCUS, (*Bl.*) *Bleek.* [No. 18000].

Pœilia fusca, BLOCH., Syst. Ichth., ed. SCHN., 1801, 453.

Cobitis pacifica, FORSTER, Descr. Anim., ed. LICHT., 1844, 235.

Cheilodipterus eulius, BUCHANAN HAMILTON, Fish. Ganges, 1822, 55, pl. 5, f. 16.

Eleotris nigra, QUOY & GAIM., Voy. Freyc. Zoöl., 1824, 259, pl. 60, f. 2.—CUV. & VAL., Hist. Nat. des Poiss., xii, 1837, 233.—BLEEKER, Verh. Bat. Gen., xxv, 1853, Nalezing. Ichth. Beng., 105, pl. 1, f. 3.

Eleotris mauritianus, BENNETT, Proc. Comm. Zoöl. Soc., i, 166.

Eleotris brachyurus, BLEEKER, Verh. Bat. Gen., xxii, 1849, *Blenn. en Gob.*, 20; Enum. Spec. Pisc. Arch. Ind., 1859, 114.

Eleotris melanurus, BLEEKER, Verh. Bat. Gen., xxii, 1849, *Blenn. en Gob.*, 21.

Eleotris pseudacanthopomus, BLEEKER, Nat. Tyds. Ned. Ind., iv, 1853, Sumatra, ii, 276.

Culius niger, BLEEKER, Nat. Tyds. Ned. Ind., xi, 1856, Bœræ, 411.

Eleotris fusca, GÜNTHER, Cat. Fish., iii, 1861, 125.—DAY, Proc. Zool. Soc., London, 1869, 517.

Eleotris incerta, BLYTH., J. A. S., of Bengal, 1860, 146.—DAY, Proc. Zool. Soc. London 1869, 517.

Eleotris soarcsi, PLAYFAIR, Fish. Zanz., 1866, 74. pl. 9, f. 4.

Culius fuscus BLEEKER, Arch. Néerland., ix, 1874, 303; x, 1875, 105.

Locality: Fresh-water streams of Oahu.

BRACHYELEOTRIS CYANOSTIGMA, Bleek. [No. 15395].

Eleotris cyanostigma, BLEEKER, Nat. Tyds. Ned. Ind., viii, 1855, Kokos-eil., iv, 452.—GÜNTHER, Cat. Fish., iii 1861, 119.—PLAYFAIR, Proc. Zool. Soc. London, 1867, 862.

Elcotriodes cyanostigma, BLEEKER, Enum. Spec. Pisc. Arch. Ind., 1859, 112.

Brachyeleotris cyanostigma, BLEEKER, Arch. Néerland., ix, 1874, 306; x, 1875, 106.

D. $6\frac{1}{11}$. A. 10. L. lat. 25. L. trans. 8-9.

Height of the body equals the length of the head, and is slightly more than one-fifth of the total length; eye not quite one-third of the length of the head, and slightly longer than the snout; the jaws equal anteriorly, and the end of the superior extends beyond the vertical from the anterior margin of the orbit. Teeth in a villiform band; an external series of longer ones; a lateral canine tooth on each side of the lower jaw, hooked backward. Præoperculum armed at the angle with a group of four small spines, coalescing by their bases. Scales ctenoid. Head covered with large scales; snout, interorbital space and maxillaries naked. The third dorsal spine produced into a filament; posterior rays of soft dorsal and anal prolonged back to the base of the caudal fin. The base of the anal ends before the termination of the dorsal, but its last rays are longer, and extend as far back as those of the dorsal. Ventrals commence under the base of the pectorals, and extend to the commencement of the anal. Pectorals slightly longer than the ventrals. Six blackish spots or bands along the sides of the body; each scale with a blue spot (white in alcohol); fins minutely dotted.

Lengths, 1.50, 1.15 inches.

Locality: Coral reefs of Oahu.

In 1862 Prof. T. Gill* made the interesting discovery that the young of the Carangoids and Scombroids have the præoperculum armed with spines, which afterward become absorbed into the substance of the bone. We have been mainly guided by this analogy in the identification of our

* Proc. Acad. Nat. Sci. Phila., 1862, 262, 325, 440.

species, which agrees perfectly well in every other particular with *cyanostrigma*. The specimens, as may be seen, are quite small, and the spines have more of the appearance of excrescences than of permanent armatures.

SICYOPTERUS STIMPSONI, (Gill) Bleek. [No. 17991].

Sicydium (Sicyopterus) stimpsoni, GILL, Proc. Acad. Nat. Sci. Phila., 1860, 101.

Sicydium stimpsoni, GÜNTHER, Cat. Fish., iii, 1861, 93.

Sicyopterus stimpsoni, Bleeker, Arch. Néerland., ix, 1874, 313.

Locality: Fresh-water streams of Oahu.

AWAOUS CRASSILABRIS, (Gthr.) Streets [Nos. 17974, 17996].

Gobius crassilabris, GÜNTHER, Cat. Fish., iii, 1861, 63.

Locality: Fresh-water streams of Oahu.

There is a marked difference between the sexes of this species, as there is probably in other species of *Gobiidae*. Professor Gill first suggested to us this probable difference, and our dissections confirmed his suggestion.

In the males the anal papilla is triangular, with a prolonged and slender apex; while in the females it is short, broadly quadrilateral, and the free margin fringed, and sometimes emarginate. The difference extends to the head also. In males it is broad, rounded in front, and the upper profile of the snout is slightly inclined downward, as in the typical *Gobius*; the lips are thick, and the end of the superior maxillary bone extends to or beyond the vertical from the center of the eye. The head of a female is narrower, more pointed in front, the lips less turned, and the end of the upper maxillary is anterior to the vertical from the center of the eye. In one specimen, a young male, we failed to find any evidence of testicles. In this the anal papilla was similar to those of the other male specimens, while the general features of the head were those of a female. In Günther's description these differences are for the most part confounded, and it would be impossible to identify the species from one sex only, but if both are at hand they conform to it in every particular.

ACENTROGOBIUS OPHTHALMOTÆNIA, (*Bleek.*) *Streets* [No. 15399].

Gobius ophthalmotænia, BLEEKER, Nat. Tyds. Ned. Ind., vii, 1854, Kokos-eil., i, 46.—GÜNTHER, Cat. Fish., iii, 1861, 37.

Gobius capistratus, PETERS, Arch. f. Naturg., 1855, pt. i, 251.—GÜNTHER, op. cit., iii, 1861, 36.—KLUNZINGER, Verh. z.-b. Ges. Wien, 1871, 476.

D. $6\frac{1}{11}$. A. $\frac{1}{10}$. L. lat. 27. L. trans. 8-9.

The height of the body is contained from 5 to $5\frac{2}{3}$ times in the total length, including the caudal fin; without the caudal it is from 4 to $4\frac{1}{2}$; the length of the head is contained from 4 to $4\frac{1}{4}$ times in the total length, including caudal; without caudal, from $3\frac{1}{3}$ to $3\frac{1}{2}$ times. Head convex above, nearly as broad as high, the width is contained about $1\frac{1}{2}$ times in the length, and the height about $1\frac{1}{3}$ times in the same; the diameter of the eye is one-fourth of the length of the head; interorbital space narrow; length of the snout about equals the diameter of the eye, obtuse; upper and lower jaws subequal in front; the end of the upper extends to under the anterior portion of the eye; cleft of the mouth slightly oblique. Teeth in the jaws in several series, an external series of enlarged teeth; in the lower jaw on either side a canine tooth, hooked backward. Neck and crown of head, cheeks, and opercles scaly. Scales on the body ctenoid. Dorsal fins not continuous, the spinous portion lower than the soft, which is as high as the body; spinous more than one-half as long as the soft. Upper pectoral rays silky in smaller specimens only; caudal rounded, as long as the head. Greenish, with five broad, brown streaks along the back, and five others, smaller and resembling spots in the smaller specimens, alternating with the upper along the middle line of the body; small spots scattered over the sides of the body; head minutely punctate, some larger, and in alcohol white, spots on the cheeks; a dark vertical band passing through the center of the eye to the inferior border of the præoperculum; a short, oblique band on the operculum; dorsal and caudal fins brown spotted; the other fins minutely dotted with brown.

Lengths, 1.70, 1.50, 1.35, 1.25.

Locality: Coral reefs of Oahu.

GLOSSOGOBIUS GIURIS, (*Buch. Ham.*) *Streets* [No. 17995].

Gobius giuris, BUCHANAN HAMILTON, Fish. Ganges, 1822, 51, pl. 33, f. 15.—CUV. & VAL., Hist. Nat. des Poiss., xii, 1837, 72.—BLEEKER, Verh. Bat. Gen., xxii, 1849, *Blenn. en Gob.*, 24.—GÜNTHER, Cat. Fish., iii, 1861, 21.

- Gobius kokius*, CUV. & VAL., op. cit., xii, 1837, 68.—JERDON, Madr. Jour., xv, 148.—BLEEKER, Verh. Bat. Gen., xxii, 1849, *Bleunn. en Gob.*, 24.—CANTOR, Catal., 180.—JACQ., Voy. Ind. Poiss., 1835, pl. 14, f. 3.
- Gobius russelii*, CUV. & VAL., op. cit., xii, 1837, 75.
- Gobius catebus*, CUV. & VAL., op. cit., xii, 1837, 76.
- Gobius kora*, CUV. & VAL., op. cit., xii, 1837, 77.
- Gobius celebicus*, CUV. & VAL., op. cit., xii, 1837, 74.—BLEEKER, Nat. Tyds. Ned. Ind., vii, 1854, Banten, 318.
- Gobius kurpah*, SYKES, Trans. Zool. Soc. London, ii, 1841, 352, pl. 61, f. 1.
- Gobius platycephalus*, PETERS, Monatsber. Berl. Acad., 1852, 681.
- Gobius phaiosoma*, BLEEKER, op. cit., xxii, 1849, *Bleunn. en Gob.*, 30; Nat. Tyds. Ned. Ind., 1851, i, f. 5.
- Gobius fusiformis*, BLEEKER, op. cit., xxii, 1849, *Bleunn. en Gob.*, 30.
- Gobius fasciato-punctatus*, RICHARDSON, Voy. Sulph. Ichth., 1844, 145, pl. 62, f. 13, 14.

D. $6\frac{1}{2}$. A. $\frac{1}{2}$. L. lat. 33.

Ten longitudinal series of scales between the second dorsal and anal fins. Height of the body is one-sixth or one-seventh of the total length, and the length of the head is one-quarter of the same. Head depressed, broader than long, the breadth is four-fifths of the length, and the height is three-fifths of the same. The diameter of the eye is contained $3\frac{1}{2}$ or 4 times in the length of the head. Interorbital space flat, proportionately broader in larger specimens than in smaller ones; in the former it nearly equals the vertical diameter of the eye. Snout depressed, length equals the diameter of the eye, upper profile obliquely descending; cleft of the mouth nearly horizontal; lower jaw prominent; the end of the upper extends to the vertical from the center of the eye. Teeth in a villiform band; an external enlarged series; no prominent canines. Upper surface and sides of the head naked; scales on the neck much smaller than those on the sides of the body; they extend nearly as far forward on the occiput as a line from the posterior border of the præoperculum. Second dorsal fin higher than the first, and nearly as high as the body; the distance of the first dorsal from the eye equals that of the snout from the posterior margin of the præoperculum. Ventrals extend nearly to the vent; pectorals somewhat longer. Caudal rounded, shorter than the head. Yellowish-brown, with five or six broad brown bands across the back; the color of these bands sometimes rather faint, and their outlines indistinct. Along the sides of the body, and alternating with the dorsal bands, is a series of rounded deep brown blotches. Under the lens all the coloration on the sides is resolved into minute dots; head dotted. A small brown spot on the

middle of the operculum ; another behind the eye, and sometimes there is one present on the upper part of the base of the pectoral. Fins minutely dotted, on the dorsal and caudal fins the dots are aggregated, and arranged in lines. No cross-streak between the eyes.

Lengths, 2.10, 1.40, 1.40 inches.

Locality : Coral reefs of Oahu.

SCORPÆNIDÆ.

SEBASTAPISTES STRONGIA,* (Cuv. & Val.) [No. 15400].

Scorpana strongia, CUV. & VAL., Hist. Nat. des Poiss., iv, 1829, 323.—QUOY & GAIM., Voy.

Astrol. Poiss., 1834, 688, pl. 11, f. 2.—LESSON, Voy. Coquil. Poiss., 1830, 213.—

GÜNTHER, Jour. Mus. Godeff., ii, 1873-75, Fische der Sudsee, i, 80 (not of Cat. Fish., ii, 1860, p. 105).

D. $11\frac{1}{9}$. A. $\frac{3}{5}$. L. lat. 45-47.

Teeth on the vomer and palatine bones; those on the latter in a narrow band.

Height of the body is contained $3\frac{1}{2}$ times in the total length, and the length of the head 3 times in the same. Interorbital space one-half the diameter of the eye; and the latter is contained three times in the length of the head. Snout as long as the diameter of the eye; jaws subequal in front; no skinny flaps. The end of the upper maxillary extends to the vertical from the center of the eye. Interorbital space deeply concave, a longitudinal ridge on either side of the bottom of the groove; three spines on the superior orbital ridge, and three on either side of the occiput; space between the latter flat; three small spines on the upper posterior orbital border; a group of three or four on the tempero-scapular region; two flat spines on the operculum, the upper of which is the larger; a large flat spine above the base of the pectoral fin; four or five on the posterior border of the præoperculum, the upper the largest. A series of short ridges, some of them ending posteriorly in spines, below the eye; springing from the inner side of the anterior nostrils are two short spines directed upward and backward, and two short

* The genus SEBASTAPISTES is proposed by Prof. Gill for the reception of the *Scorpana guttata*, Girard, *Scorpana strongia*, Cuv. & Val., and *Sebastichthys cyanostigma*, Bleeker, which are segregated, in the words of Gill, "from their allies by the naked crown and jaws, the spinous armature of the inferior margin of the præorbital, the procurrent bases of the pectoral fins, &c. The genus is intermediate between the Sebastoid and Scorpænoid genera, and nearly related to *Parascorpana*, Blkr."

ridges running from their bases bridge the short concavity behind; on the middle of the snout are two low ridges, diverging anteriorly. Præ-orbital spines conspicuous; two, larger than the rest, diverge from a common base; the posterior and larger is directed downward across the superior maxillary bone; the other is directed inward close to the body of the bone; above the base of the posterior is another directed backward; the surface of the præorbital irregularly ridged; some of the ridges ending in spines; rudimentary scales on sides of the head. The spinous portion of the dorsal fin higher than the soft. The third and fourth spines are the longest, shorter than the second anal, and nearly one-half the length of the head; second anal longer than the third, stout and striated. Whitish, clouded and spotted with dark brown, and dotted all over with minute dark brown dots. The brown spots on the head are separated by bluish-white lines.

Total length, 2.60 inches.

Locality: Honolulu, Oahu.

LABRIDÆ.

PSEUDOCHEILINUS HEXATÆNIA, *Bleek.* [No. 17989].

Cheilinus hexatænia, BLEEKER, Act. Soc. Sc. Indo.-Nederl., ii, 1857, Amboina, viii, 84.

Pseudocheilinus hexatænia, BLEEKER, Atl. Ichth., i, 1862, *Labr.* 73, pl. 23, f. 2.—GÜNTHER, Cat. Fish., iv, 1862, p. 134.—KLUNZINGER, Verh. z.-b. Ges. Wien, 1871, 537.

Pseudocheilinus psittaculus, KNER & STEINDACHNER, Sitz. d. k. Ak. Wiss. Wein, liv, 1866, 376, f. 7.

D. $\frac{9}{12}$. A. $\frac{3}{10}$. P. $\frac{2}{12}$. L. lat. 24. L. trans. $\frac{2}{6}$.

The height of the body equals the length of the head, and is contained $3\frac{1}{2}$ times in the total length; head longer than high, with the upper profile slightly concave, vertex convex; the diameter of the eye is one-fifth of the length of the head; the snout about one-third the length of the head; interorbital space equals the diameter of the eye; jaws equal anteriorly; chin not prominent; the end of the upper maxillary bone does not extend to the vertical from the anterior border of the orbit; its length is contained 3 times in the length of the head. Teeth in a single series; six canines in the upper jaw anteriorly, the posterior pair much larger than the others, and bent outward and backward; two canines in the lower jaw anteriorly; no posterior canines. Three series of large scales on the cheeks, the lower series covering the limb of the

præoperculum; præoperculum subrectangular, posterior border entire, membranous, angle obtusely rounded; operculum scaly. A row of elongated scales on each side of the vertical fins, forming sheaths at their bases; two elongated scales between the ventrals. Lateral line interrupted; tubules simple. The soft portion of the dorsal fin higher than the spinous; spines subequal; second anal spine the longest; the posterior rays of the soft dorsal and anal prolonged. Pectorals rounded, seven times in the total length. Ventrals pointed; their length is contained $8\frac{2}{3}$ times in the total length. Caudal rounded. Color (in alcohol) olive-green, diluted inferiorly, with seven blackish, longitudinal bands, which increase slightly in breadth posteriorly; the four upper bands commence above the level of the inferior border of the orbit; the two following begin in the axillary space; the lowest indistinct. Five of the bands are continued on the caudal peduncle; the upper and lower cease opposite the termination of the dorsal and anal fins. A narrow white line on the middle of the snout, extending from between the eyes to the extremity of the snout. Short linear spots on the dorsal fin; the rays and spines green. No ocellus on the upper part of the base of the caudal, or anywhere on the caudal peduncle.

Total length, 4.20 inches.

Locality: Honolulu, Oahu.

This fish is so characteristic that we do not hesitate to pronounce it *hexatania*, although there are a great many discrepancies between the above description and those given by Bleeker and others. We find three series of scales on the cheeks, instead of two, and six canine teeth in the upper jaw, instead of eight, as is given by Bleeker. Kner and Steindachner found the hinder border of the præoperculum finely serrated, while in our specimen it is entire and membranous. According to Bleeker the diameter of the eye is one-third of the length of the head, and the length of the superior maxilla one-fourth of the same; the pectorals $5\frac{2}{3}$ in the total length, and the ventrals six times in the same. We find a discrepancy between the text of this author and the measurements of his figure. The latter accord more nearly with our own measurements. In the present specimen there is no evidence of the ocellus at the base of the caudal, which all other writers have observed.

STETHOJULIS AXILLARIS, (Q. & G.) Bleeker [No. 15394].

Julis axillaris, QUOY & GAIM., Voy. Uran. Zool. Poiss., 1824, 272.—CUV. & VAL., Hist. Nat. des Poiss., xiii, 1839, 472.

Julis (Halichoeres) bandanensis, BLEEKER, Nat. Tyds. Ned. Ind., ii, 1851, Banda, i, 254.

Stethojulis axillaris, BLEEKER, Atl. Ichth., i, 1862, *Labr.*, 136, pl. 44, f. 7.—GÜNTHER, Cat. Fish., iv, 1862, 142.—KLUNZINGER, Verh. zool.-bot. Gesells. Wien, xxi, 1871, 541.

D. $\frac{9}{11}$. A. $\frac{2}{11}$. P. $\frac{2}{12}$. L. lat. 27. L. trans. $\frac{2}{9}$.

We have examined seven specimens from this locality, and not one of them showed more than two spinous rays in the anal fin. This is interesting, from the fact that all the authorities whom we have consulted give three spines to this fin.

Locality: Honolulu, Oahu.

CHEILIO INERMIS, (Forsk.) Richards. [No. 17977].

Labrus inermis, FORSKAL, Descr. Anim., 1775, 34.—BLOCH, Syst. Ichth., ed. SCHN., 1801, 262.

Labrus hassek, LACÉP., Hist. des Poiss., iii, 1803, 513.

Cheilio auratus (COMMERS.), LACÉP., op. cit., iv, 1803, 433.—QUOY & GAIM., Voy. Uran. Zool., 1824, 274, pl. 54, f. 2.—CUV. & VAL., Hist. Nat. des Poiss., xiii, 1839, 341.—BLEEKER, Nat. Tyds. Ned. Ind., ii, 1851, Celebes, i, 221.

Cheilio fuscus (COMMERS.), LACÉP., Hist. des Poiss., iv, 1803, 433.—CUV. & VAL., op. cit., xiii, 1839, 349.

Labrus fusiformis, RÜPPELL, N. W. Fische, 1837, 7, pl. 1, f. 4.

Cheilio cyanochloris, CUV. & VAL., op. cit., xiii, 1839, 346, pl. 382.

Cheilio forskalii, CUV. & VAL., op. cit., xiii, 1839, 349.

Cheilio hemichrysos, CUV. & VAL., op. cit., xiii, 1839, 351.—BLEEKER, Nat. Tyds. Ned. Ind., ii, 1851, Banda, i, 255.

Cheilio viridis, CUV. & VAL., op. cit., xiii, 1839, 352.

Cheilio microstoma, CUV. & VAL., op. cit., xiii, 1839, 353.

Cheilio ramosus, JENYNS, Zool. Beagle, Fish., 1842, 102.

Chilio auratus, PETERS, Monatsb. Preuss. Ak. Wiss., 1855, 453.

Chilio bicolor, BIANC., Mém. Ac. So. Bologn., viii, 1859, Spec. Zool. Mosamb., 46, pl. 25.

Cheilio inermis, RICHARDSON, Rep. Ichth. Chin. Jap., Rep. 15th Meet. Brit. Assoc., 1846, 258.—BLEEKER, Atl. Ichth., i, 1862, *Labr.*, 82, pl. 31, f. 4.—GÜNTHER, Cat. Fish., iv, 1862, 194.

Chilio inermis, KLUNZINGER, Verh. zool.-bot. Gesells. Wien, xxi, 1871, 530.

Five specimens gave the following formula for the dorsal and anal fins:

D. $\frac{9}{13}$. A. $\frac{3}{11}$.

Locality: Honolulu, Oahu.

Bull. N. M. No. 7—5

? JULIS MELANOPTERA, *Gthr.* [No. 15401].

Julis melanoptera, GÜNTHER, Cat. Fish., iv, 1862, 183.

$$D. \frac{8}{13}. \quad A. \frac{2}{11}. \quad L. \text{ lat. } 27. \quad L. \text{ trans. } \frac{2\frac{1}{2}}{9}.$$

The height of the body is slightly more than the length of the head, and one-fourth of the total length (the caudal lobes not included). The diameter of the eye is two-ninths of the length of the head, and one and a half times in the length of the snout. No posterior canine teeth; two anterior canine teeth of the lower jaw are received between the two of the upper. Dorsal spines pungent, shorter than the rays; caudal lobes produced; ventrals pointed, not prolonged, and are five-sevenths of the length of the pectorals; the latter shorter than the head—seven-ninths of its length. A few scales on the supraopercular region. Colors in alcohol:—head uniform dark purplish, without any marking; body brownish-olive; dorsal and anal fins dark violet, the former with a black spot anteriorly between the first and fourth spines; pectoral with an oblique oblong black spot, and a black spot above on the base of the fin.

Locality: Honolulu, Oahu.

The only point about this description which renders the identification anyways doubtful is the absence of the "broad, lighter, transverse band below the second to the sixth dorsal spines, extending to the belly;" the colors are somewhat faded, which, probably, accounts for its absence. There is no habitat assigned to the species by Günther, but he gives Ceylon as a probable locality.

POMACENTRIDÆ.

GLYPHIDODON SAXATILIS, (*Linn.*) *Gthr.* [No. 15393].

Chatodon saxatilis, LINN., Syst. Nat., i, 1766, 466.—FORSK., Descr. Anim., 1775, 62.—BLOCH, Ichth., vi, 1787, 71, pl. 206, f. 2.

Chatodon marginatus, BLOCH, op. cit., vi, 1787, pl. 207.—LACÉP., Hist. des Poiss., iv, 1803, 451, 463.

Chatodon mauritii, BLOCH, op. cit., vi, 1787, pl. 213, f. 1.—BLOCH, Syst. Ichth., ed. SCHN., 1801, 234.—LACÉP., op. cit., iv, 1803, 452, 470.

Chatodon sargoides, LACÉP., op. cit., iv, 1803, 453, 471, 472.

Labrus scxfasciatus, LACÉP., op. cit., iii, 1803, 477, pl. 19, f. 2.

Chatodon tyrwhitti, BENNETT, Fish. of Ceylon, 1834, pl. 25.

Glyphisodon saxatilis, CUV. & VAL., Hist. Nat. des Poiss., v, 1830, 446.—RÜPPELL, Atl. Fische, 1828, 35; N. W. Fische, 1837, 126.

Glyphisodon rahti, CUV. & VAL., op. cit., v, 1830, 456; ix, 1833, 507.—BLEEKER, Nat. Tyds. Ned. Ind., iii, 1852, Amb. & Cer., 287.—RICHARDSON, Rep. Ichth. Chin., Rep. 15th Meet. Brit. Assoc., 1846, 253.

Glyphisodon celestinus (SOLAND.), CUV. & VAL., op. cit., v, 1830, 464; ix, 1833, 508.—RICHARDSON, op. cit., 1846, 253.—BLEEKER, Verh. Bat. Gen., xxi, 1846, *Labr. Cten.*, 15.

Glyphisodon tyrwhitti, RICHARDSON, op. cit., 1846, 253.

Glyphisodon quadrifasciatus, BLEEKER, Verh. Bat. Gen., xxi, 1846, *Labr. Cten.*, 17.

Glyphisodon waigiensis, BLEEKER, Verh. Bat. Gen., xxi, 1846, *Labr. Cten.*, 13.

Sparus fasciatus, GRONOV., Syst. (1780), ed. GRAY, 1854, 60.

Glyphidodon saxatilis, GÜNTHER, Cat. Fish., iv, 1862, p. 35.—KLUNZINGER, Verh. zöol.-bot. Ges. Wien, xxi, 1871, 524.

Glyphidodon celestinus, GÜNTHER, Cat. Fish., iv, 1862, 38.

Locality: Honolulu, Oahu.

Our specimens from this locality agree more closely with Günther's description of *G. saxatilis*, than with that of *G. celestinus*; which, however, they should correspond with, if there were any real specific differences between them. We, therefore, do not hesitate to refer them both to one species, as has been done by Klunzinger.

ACANTHURIDÆ.

ACANTHURUS TRIOSTEGUS, var. SANDVICENSIS, Streets. [No. 15398].

Our collection from these islands does not contain a single specimen of the typical *trioptegus*. We have twenty-three specimens, collected in the harbor of Honolulu, varying in length from 1.2 to 4.8 inches, and they present certain peculiarities in common which stamp them as a well-marked variety.

The band down the middle of the forehead to the extremity of the snout is absent. The second vertical line on the side of the body ceases, as in *trioptegus*, in the axil of the pectoral fin; but, instead of there being but a small round black spot on the outer surface of the base of that fin, as in the typical examples, there commences, in the same situation, a line which passes obliquely downward and backward to near the ventral surface of the body. Finally, in *A. trioptegus* there is a small black spot on either side of the caudal peduncle inferiorly and one superiorly; in our variety, the lower spots are invariably wanting. In every other respect the specimens correspond exactly to the description as given by Günther. These differences cannot depend upon age, for we have com-

pared them with specimens of the same size from other localities, and find the peculiarities to hold good. Cuvier and Valenciennes only, of ichthyological writers, speak of the presence, sometimes, of a line on the breast—"Il y a quelquefois de chaque côté de la poitrine une ligne ou une série longitudinale de points bruns"—but it is not associated in their description with the absence of the other markings which we have mentioned.

Locality: Harbor of Honolulu, Oahu.

ACANTHURUS BLOCHI, C. & V. [Nos. 15397, 17973].

Acanthurus blochi, CUV. & VAL., Hist. Nat. des Poiss., x, 1835, 209.—GÜNTHER, Jour.

Mus. Godeff., ii, 1873-75, Fische der Sudsee, i, 109, pl. 69, f. B.

Acanthurus annularis, CUV. & VAL., op. cit., x, 1835, 209 (young).

Acanthurus xanthopterus, CANTOR, Mal. Fish., 209, f. 4 (nec C. & V).

Acanthurus matoides, GÜNTHER, Cat. Fish., iii, 1861, 330.—KLUNZINGER, Verh. zool.-bot.

Gesel., xxi, 1871, Fisch. d. Roth. Meer, 503.

Locality: Harbor of Honolulu, Oahu.

NASEUS UNICORNIS, (Forsk.) Gthr. [No. 17976].

Chatodon unicornis, FORSK., Descr. Anim., 1775, 63.

Monoceros raii, BLOCH, Syst. Ichth., ed. SCHN., 1801, 181.

Monoceros biaculeatus, BLOCH, Syst. Ichth., ed. SCHN., 1801, 180, pl. 42.

Naseus fronticornis, CUV. & VAL., Hist. Nat. des Poiss., x, 1835, 259.—SCHLEG., Faun.

Japon. Poiss., 1850, 129, pl. 69.

Harpagus monoceros, FORSTER, Descr. anim., 1844, 219.

Naseus unicornis, GÜNTHER, Cat. Fish., iii, 1861, 348.—KLUNZINGER, Verh. zool.-bot.

Ges., xxi, 1871, Fisch. d. Roth. Meer 512.—GÜNTHER, Jour. Mus. Godeff., ii, 1873-75, Fische der Sudsee, i, 118, pl. 78.

Naseus olivaceus (SOLAND.), CUV. & VAL., op. cit., x, 1835, 288.—GÜNTHER, Cat.

Fish., iii, 1861, 352 (young).

Locality: Honolulu, Oahu.

CARANGIDÆ.

TRACHUOPS MAURITIANUS, (Q. & G.) Streets [No. 17998].

Caranx mauritianus, QUOY & GAIM., Voy. Uran. Zool., 1824, 359.—CUV. & VAL., Hist. Nat. des Poiss., ix, 1833, 60.

Caranx macrophthalmus, RÜPPELL, Atl. Fisch., 1828, 97, pl. 25, f. 4.—KLUNZINGER, Verh. zool.-bot. Gesel., xxi, 1871, Fisch. d. Roth. Meer, 458 (nec Agass.).

Caranx crumenophthalmus, GÜNTHER, Cat. Fish., ii, 1860, 429 (in part); Jour. Mus. Godeff., pt. xi, 1876, Fische der Sudsee, pt. v, 131.

D. $8\frac{1}{2}$. A. $2\frac{1}{2}$. L. plates 36.

Teeth in the upper jaw in a narrow villiform band; those in the lower jaw even, in a single series; teeth on the vomer, palatines, and tongue.

Height of the body is contained $4\frac{3}{4}$ times in the total length, and the length of the head slightly more than 4 times in the same. The diameter of the eye is one-fourth of the length of the head, and equals the length of the snout, and interorbital space. Interorbital space elevated into a median crest. Lower jaw projecting beyond the upper; the end of the latter extends somewhat beyond the vertical from the anterior margin of the eye. Breast scaly; lateral line scarcely bent; scales becoming plate-like below the middle of the second dorsal fin. Pectoral slightly longer than the head. Opercular spot distinct.

Locality: Harbor of Honolulu, Oahu.

On comparing this species with indubitable specimens of *crumenophthalmus* from the Atlantic, we find the following characteristic differences. In the latter the eye is much larger—little over three times in the length of the head; the interorbital space is much more flattened; the end of the upper jaw extends further backward; and the pectoral fin is shorter—not equal to the head-length. A more important character, however, is in the shape of the interopercular bone. In *mauritanus* it is very obliquely rounded, and the triangular space of the isthmus is almost wholly exposed between the edges of the bones of the opposite sides; in the Atlantic fish, on the contrary, the interoperculum is nearly rectangular, and the inferior edges of the bones overlap along nearly the entire extent of the isthmus, leaving but a very small space of it uncovered at the angles, which are slightly rounded; there is also a broad, shallow notch on the posterior border of the bone. Cuvier and Valenciennes, in their diagnosis of the species, direct attention to this character, which seems to have been entirely overlooked by later ichthyologists.

C. hasselti, Gthr., is probably synonymous with this species.

CARANGUS MELAMPYGUS, (C. & V.) Streets [No. 17980].

Caranx melampygus, CUV. & VAL., Hist. Nat. des Poiss., ix, 1833, 116.—GÜNTHER, Cat. Fish., ii, 1860, 446; Jour. Mus. Godeff., 1876, pt. xi, Fische der Sudsee, pt. v. 133, pl. 86.

Caranx stellatus, EYD. & SOUL., Voy. Bonite, Poiss. 167, pl. iii, f. 2.—GÜNTHER, Cat. Fish., ii, 1860, 436.

Caranx bixanthopterus, RÜPP., N. W. Fische, 1837, 49, pl. 14, f. 2.—KLUNZINGER, Verh. zool.-bot. Ges., xxi, 1871, Fisch. d. Roth. Meer, 464.

$$D. 8\frac{1}{22-24}. \quad A. 2\frac{1}{19}. \quad L. \text{ plates } 36.$$

The number of rays in the anal fin did not vary in the five specimens

examined. The anterior, pointed portions of the second dorsal and anal blackish.

Locality: Harbor of Honolulu, Oahu.

CARANGUS CHRYSOS, (Mitch.) Gill [No. 17987].

Scomber carangus, BLOCH, *Naturg. ausländ. Fische*, 1785, 340.—BLOCH, *Syst. Ichth.*, ed. SCHN., 1801, 28.

Scomber chrysos, MITCHELL, *Trans. Lit. & Phil. Soc. New York*, i, 1815, 424.

Caranx carangus, CUV. & VAL., *Hist. Nat. des Poiss.*, ix, 1833, 91.—CUV., *Règne Anim.*

III. Poiss., 1829-'30, pl. 57, f. 2.—GUICHEN., *Poiss. ROMON DE LA SAGRA*, *Hist.*

Cuba, 111.—GÜNTHER, *Cat. Fish.*, ii, 1860, 448.

Caranx chrysos, CUV. & VAL., *op. cit.*, ix, 1833, 98 (*nee* DeKay, *Gthr.*, *et al.*).

Caranx ekala, CUV. & VAL., *op. cit.*, ix, 1833, 117.

Caranx xanthopygus, CUV. & VAL., *op. cit.*, ix, 1833, 109.

Carangus esculentus, GIRARD, *U. S. & Mex. Bound. Surv.*, 23, pl. xi, f. 1-3.

Carangus chrysos, GILL, *Proc. Acad. Nat. Sci. Phila.*, 1862, 434.

$$D. 8 \frac{1}{20-22}. \quad A. 2 \frac{1}{17-18}. \quad \text{Lat. plates 31.}$$

Height of body contained 4 times in the total length, and length of head 3 times in the same. Breast naked. Lower jaw has larger teeth intermixed with the others; end of the upper jaw extends beyond the vertical from the center of the eye. An opercular spot; margin and point of second dorsal fin blackish; anal yellow.

Length 4.80.

Locality: Honolulu, Oahu.

CHORINEMUS SANCTI PETRI, Cuv. & Val. [No. 17992].

Chorinemus sancti petri, CUV. & VAL., *Hist. Nat. des Poiss.*, viii, 1831, 379, pl. 236.—

GÜNTHER, *Cat. Fish.*, ii, 1860, 473; *Jour. Mus. Godeff.*, 1876, pt. xi, *Fische der Sudsee*, pt. v, 138.—BLEEKER, *Verh. Bat. Gen.*, xxiv, 1852, *Makr.*, 45.

—PETERS, *Arch. fur Naturg.*, 1855, pt. i, 245.

Chorinemus toloo, CUV. & VAL., *op. cit.*, viii, 1831, 377.—GÜNTHER, *Cat. Fish.*, ii, 1860,

473.—KLUNZINGER, *Verh. zool.-bot. Ges.*, xxi, 1871, *Fisch. d. Roth. Meer*, 447.

Chorinemus moadetta, CUV. & VAL., *op. cit.*, viii, 1831, 382.—KLUNZINGER, *Verh. zool.-*

bot. Ges., xxi, 1871, *Fisch. d. Roth. Meer*, 448.

Chorinemus mauritianus, CUV. & VAL., *op. cit.*, viii, 1831, 382.

Chorinemus tol, KNER, *Novara Exped. Fisch.*, 1866, 162.

$$D. 7 \frac{1}{20}. \quad A. 2 \frac{1}{15}.$$

Immature specimens. Height of body and length of head nearly equal, and almost one-fifth of the total. Length of snout somewhat more than the diameter of the eye; upper jaw extends beyond the vertical from the center of the eye. Spots on the sides of the body absent. Top of second dorsal black.

Locality: Honolulu, Oahu.

MULLIDÆ.

UPENEUS TRIFASCIATUS, (*Lacép.*) *Cuv. & Val.* [No. 17990].

Mullus trifasciatus, LACÉP., Hist. des Poiss., iii, 1803, 494, pl. 15, f. 1.

Mullus multifasciatus, QUOY & GAIM., Voy. Freyc. Poiss., 1824, pl. 59, f. 1.

Upeneus trifasciatus, CUV. & VAL., Hist. Nat. des Poiss., iii, 1829, 468.—JENYNS, Zool. Beagle, Fishes, 1842, 25.—BLEEKER, Nat. Tyds. Ned. Ind., ii, 1851, Banda, i, 237.—GÜNTHER, Cat. Fish., i, 1859, 407; Jour. Mus. Godeff., ii, 1873-75, Fische der Sudsee, i, 59, pl. 44, f. B.-C.

Locality: Harbor of Honolulu, Oahu.

Two specimens. Both having a black spot behind the eye, as in *U. bifasciatus*; the color on the other parts of the body arranged as in *U. trifasciatus*.

UPENEOIDES VITTATUS, (*Forsk.*) *Bleek.* [No. 17999].

Mullus vittatus, FORSKAL, Faun. Arab., 31.—BLOCH, Syst. Ichth., ed. SCHN., 1801, 79.—LACÉP., Hist. des Poiss., iii, 1803, 382, 401, pl. 14, f. 1.—SHAW, Zool., iv, 1803, 616, pl. 89.

Mullus bandi, SHAW, op. cit., iv, 1803, 615.

Upeneus vittatus, CUV. & VAL., Hist. Nat. des Poiss., iii, 1829, 448.

Upeneus bivittatus, CUV. & VAL., op. cit., vii, 1831, 520.

Upeneus bitaniatus, BENNETT, Proc. Comm. Zool. Soc., 1830-'31, 59.

Upeneoides bivittatus, BLEEKER, Verh. Bat. Gen., xxii, 1849, *Perc.*, 64; Nat. Tyds. Ned. Ind., viii, 1855, Amboina, vi, 411.—DAY, Proc. Zool. Soc. London, 1867, 702.

Upeneoides vittatus, BLEEKER, Act. Soc. Reg. Sc. Ind. Néerl., ii, 1857, Amboina, 43.—GÜNTHER, Cat. Fish., i, 1859, 397; Jour. Mus. Godeff., ii, 1873-75, Fische der Sudsee, i, 55.

Locality: Harbor of Honolulu, Oahu.

The oblique black bands on the lower caudal lobe are broader than those on the upper lobe.

SERRANIDÆ.

MORONOPSIS MARGINATUS, (*C. & V.*) *Gill.* [No. 17993].

Dules marginatus, CUV. & VAL., Hist. Nat. des Poiss., iii, 1829, 116, pl. 52.—HOMBRON et JAQUINOT, Dumont D'Urville, Voy. Pôle Sud, Poiss., 1853-'54, 41, pl. 3, f. 3.—GÜNTHER, Cat. Fish., i, 1859, 268; Jour. Mus. Godeff., ii, 1873, Fische der Sudsee, i, 24.

Dules malo, CUV. & VAL., op. cit., vii, 1831, 479.—DUMONT D'URVILLE, Voy. Pôle Sud, Poiss., 1853-'54, 41, pl. 3, f. 4.—GÜNTHER, Cat. Fish., i, 1859, 270.

Dules mato, LESSON, Voy. Coquille, Zool., ii, 1826-'30, 223.

Dules leuciscus, JENYNS, Zool. Beagle, Fish., 1842, 17.

Moroneopsis ciliatus, BLEEKER, Arch. Neerl., 1872, 376.

Moroneopsis marginatus, GILL, Proc. Acad. Nat. Sci. Phila., 1863, 82.

D. $9\frac{1}{11}$. A. $3\frac{3}{11}$. L. lat. 53. L. trans. $\frac{5}{12}$.

Coloration as in *Dules marginatus*, as given by Günther in Fische der Sudsee. Sides of the body spotted.

Locality: Waialua, Oahu.

CHILODIPTERIDÆ.

APOGON AURITUS, Cuv. & Val. [No. 15396].

Apogon auritus, CUV. & VAL., Hist. Nat. des Poiss., vii, 1831, 443.—GÜNTHER, Jour. Mus. Godeff., ii, 1873, Fische der Sudsee, 1, 23.

Apogon punctulatus, RÜPPELL, N. W. Fische, 1837, 88, pl. 22, f. 4.

Apogon variegatus, VALENCIENNES, Nouv. Ann. Mus., i, 55.

Apogonichthys polystigma, BLEEKER, Nat. Tyds. Ned. Ind., vi, 1854, 484.

Apogonichthys auritus, GÜNTHER, Cat. Fish., i, 1859, 246.—PLAYFAIR, Fish. Zanz., 1866, 21.

Locality: Honolulu, Oahu.

PRIACANTHIDÆ.

PRIACANTHUS CAROLINUS, Cuv. & Val. [No. 17994].

Priacanthus carolinus, CUV. & VAL., Hist. Nat. des Poiss., iii, 1829, 105.—LESSON, Voy. Coq. Zool. Poiss., ii, 1826-'30, 224.—BLEEKER, Nat. Tyds. Ned. Ind., 1851, 235.—GÜNTHER, Cat. Fish., i, 1859, 219; Jour. Mus. Godeff., ii, 1873-'75, Fische der Sudsee, i, 17, pl. 18.

Locality: Harbor of Honolulu, Oahu.

Immature specimens. During the month of September, 1873, an immense shoal of the young of this species entered the harbor of Honolulu. The largest of them did not exceed three and a half inches in length. This shoaling, we were told, has occurred a number of times, but at uncertain intervals. The coming of the "red-fish," as they are called, foreshadows in the minds of the simple natives the sickness and death of some member of the royal family; and, on account of the pliant disposition of the Kanakas, the prophecy is usually fulfilled. But the fish are by no means unwelcome visitants to the common people, who are busy catching them night and day, as long as they remain. They are dried, and eaten without cooking.

CIRRHITIDÆ.

CIRRHITES FORSTERI, (Bl.) Gthr. [No. 17978].

Perca tæniata, FORSTER, Descr. Anim., ed. LICHT., 1844, 224.

Grammistes forsteri, BLOCH, Syst. Ichth., ed. SCHN., 1801, 191.

Sparus pantherinus, LACÉP., Hist. des Poiss., iv, 1803, 160, pl. 6, f. 1.

Cirrhitès pantherinus, CUV. & VAL., Hist. Nat. des Poiss., iii, 1829, 70.—LESSON, Voy. Coq. Poiss., 1826-30, 225, pl. 22, f. 1.—BLEEKER, Nat. Tyds. Ned. Ind., 1851, ii, Banda, i, 232.

Serranus tankervillei, BENNETT, Fishes of Ceylon, 1834, pl. 27.

Cirrhitès forsteri, GÜNTHER, Cat. Fish., ii, 1860, 71.—GILL, Proc. Acad. Nat. Sci. Phila., 1863, 107.—GÜNTHER, Jour. Mus. Godeff, ii, 1874, Fische der Sudsee, i, 69, pl. 49, f. A.

Paracirrhitus forsteri, BLEEKER, Verh. k. Ak. Wet. Amst., 1875, xv, 6.

Locality : Honolulu, Oahu.

MUGILIDÆ.

MUGIL CEPHALOTUS, Cuv. & Val. [Nos. 18002, 18003].

Mugil cephalotus, CUV. & VAL., Hist. Nat. des Poiss., xi, 1836, 110.—GÜNTHER, Cat. Fish., iii, 1861, 419.

Mugil japonicus, SCHLEG., Faun. Japon. Poiss., 1850, 134, pl. 72, f. 1.

Mugil macrolepidotus, RICHARDSON, Rep. Ichth. Chin., Rep. 15th Meet. Brit. Assoc., 1846, 249.

D. 4½. A. 3. L. lat. 40-42. L. trans. 14-15.

The height of the body and the length of the head are nearly equal, and are one-fifth of the total length. Snout broad, depressed, longer than the eye; lips thin, provided with minute cilia. Deep cavity in front of the vomer. The angle formed by the lower jaw in front is a right angle; a narrow stripe of the maxillary is visible behind the intermaxillary; præorbital not emarginate, finely denticulated on its anterior edge and at its extremity, which is obliquely truncated. Cleft of the mouth is not twice as broad as deep. The width of the interorbital space is contained more than twice in the length of the head. Eye-nearly covered with a broad adipose membrane, leaving the pupil exposed through a narrow vertical slit in the middle. Three series of scales between the eye and the inferior border of the præoperculum; angle of præoperculum produced posteriorly. Pectoral inserted above the middle of the height of the body; it terminates on the eighth scale of the lateral line; spinous dorsal commences on the tenth scale of the lateral

line, and on the twenty-second from the end of the snout; anterior dorsal spines more than one-half the length of the head, and they are situated on the middle between the end of the snout and the base of the caudal fin. The second dorsal commences on the twenty-third row of scales of the lateral line; the space between the origins of the two dorsals nearly equals the length of the head. Ventrals midway between the base of the pectoral and the spinous dorsal. Anal commences before the soft dorsal; both emarginate behind.

Shining golden, darker above, with longitudinal streaks along the series of scales.

Locality: Harbor of Honolulu, Oahu. Very numerous.

There seems to be very little difference between this species and *Mugil dobula*, Gthr.

AULOSTOMIDÆ.

AULOSTOMA CHINENSE, (L.) Schleg. [No. 15371].

Fistularia chinensis, LINN., Syst. Nat. i, 1766, 515.

Aulostoma chinensis, LACÉP., Hist. des Poiss., v, 1803, 357.

Aulostoma chinense, SCHLEG., Faun. Japon. Poiss., 1850, 320.—RICHARDSON, Rep. Ichth. Chin., Rep. 15th Meet. Brit. Assoc., 1846, 247.—PETERS, Arch. f. Naturg., 1855, i, 258.—GÜNTHER, Cat. Fish., iii, 1861, 538.

Polyptericthys valentini, BLEEKER, Nat. Tyds. Ned. Ind., iv, 1853, Ternate, ii, 608.

D. 10-27. A. 28.

Brownish, with vertical bands along the sides of the body and snout; one or two of the bands on the snout oblique. Base of soft dorsal and anal fins black; a short black streak a little distance from the base anteriorly, more plainly visible on the dorsal than on the anal fin; on the former, another short streak above the first. A round black spot on the base of the ventrals, and one above and below on the caudal fin.

Locality: Honolulu, Oahu.

FISTULARIDÆ.

FISTULARIA SERRATA, Cuv. [No. 17988].

Fistularia tabaccaria, var. BLOCH, Naturg. Ausländ, Fische, viii, 1794, 130, pl. 387, f. 2-3.—BLOCH, Syst. Ichth., ed SCHN., 1801, 114.

Fistularia immaculata, CUV., Règne Anim., 1817.—RICHARDSON's Ichth. Chin., Rep. 15th Meet. Brit. Assoc., 1846, 247.—SCHLEG. Faun. Japon. Poiss., 1850, 320.—BLEEKER, Nat. Tyds. Ned. Ind., iii, 1852, Amb. & Cer., 281; Verh. Acad. Wet. Amsterd., Japan, ii.

Fistularia serrata, CUV., Règne Anim., 1817.—GÜNTHER, Cat. Fish., iii, 1861, 533.

Fistularia commersoni, RÜPPELL, N. W. Fische, 1837, 142.—PETERS, Arch. f. Naturg., 1855, i, 258.

Cannorhynchus immaculatus, CANTOR, Catalogue, 211.

Locality: Honolulu Harbor, Oahu.

BELONIDÆ.

BELONE PLATURA, Rüpp. [No. 17983].

Belone platura, RÜPPELL, N. W. Fische, 1837, 73, pl. 20, f. 1.—CUV. & VAL., Hist. Nat. des Poiss., xviii, 1846, 451.—BLEEKER, Act. Soc. Sc. Indo-Ned., ii, 1857, Amboina, viii, 85.—GÜNTHER, Cat. Fish., vi, 1866, 237.—KLUNZINGER, Verh. zööl.-bot. Ges., xxi, 1871, Fische d. Roth. Meer, 577.

Belone carinata, CUV. & VAL., op. cit., xviii, 1846, 437.—GÜNTHER, Cat. Fish., vi, 1866, 236.

D. 14-15. A. 19-20.

Body subpentagonal; tail depressed, strongly carinated; the median shallow groove on the upper surface of the head scaly. Two specimens gave nineteen rays in the anal fin, and one gave twenty.

Length, 15 inches.

Locality: Harbor of Honolulu, Oahu.

SCOMBERESOCIDÆ.

EXOCÆTUS SPECULIGER, Cuv. & Val. [No. 17985].

Exocætus speculiger, CUV. & VAL., Hist. Nat. des Poiss., xix, 1846, 94.—BLEEKER, Ned. Tydsch. Dierk., iii, 1865, 122.—GÜNTHER, Cat. Fish., vi, 1866, 287.

Origin of the dorsal fin is behind the anal; pectoral with an oblique white band across its lower half anteriorly; white edged. Ventrals white; grayish in the axil, and with the middle rays gray.

Locality: Hawaiian Islands.

EXOCÆTUS BRACHYPTERUS, Solander [No. 17986].

Exocætus brachypterus, SOLANDER, MSS.—RICHARDSON, Rep. Ichth. Chin., Rep. 15th Meet. Brit. Assoc., 1846, 265.—GÜNTHER, Cat. Fish., vi, 1866, 280.

Exocætus mento, CUV. & VAL., Hist. Nat. des Poiss., xix, 1846, 124.—BLEEKER, Verh. Bat. Gen., xxiv, 1852, Snœk., 21.—GÜNTHER, Cat. Fish., vi, 1866, 281.

Parcoxætus mento, BLEEKER, Ned. Tydschr. Dierk., iii, 1865, 126.

D. 12. A. 13.

One or two very short barbules at the symphysis of the lower jaw. Height of the body is contained $5\frac{1}{2}$ times in the total length, and the

length of the head $4\frac{1}{3}$ times in the same. Snout shorter than the eye. Interorbital space flat, and its width equals the diameter of the eye; the latter is one-third of the length of the head. Origins of the dorsal and anal fins opposite to each other; dorsal high and pointed; the anterior rays, when laid backward, reach to the caudal fin. Anal very low. Lower caudal lobe longer than the head. Length of the pectoral is one-half of the total length, reaching nearly to the middle of the dorsal fin. Ventrals extend to the anal, and are inserted midway between the snout and the root of the caudal fin. The upper part of the dorsal is black; pectorals blackish, anals and ventrals whitish.

Total lengths, 6.00, 6.50 inches.

Locality : Hawaiian Islands.

SCOPELIDÆ.

SAURIDA NEBULOSA, Cuv. & Val. [No. 15392].

Saurida nebulosa, CUV. & VAL., Hist. Nat. des Poiss., xxii, 1849, 504, pl. 649.—BLEEKER, Nat. Tyds. Ned. Ind., iii, 1852, 292.—GÜNTHER, Cat. Fish., v, 1864, 399.—KLUNZINGER, Verh. zööl.-bot. Ges., xxi, 1871, Fische d. Roth. Meer, 591.

D. 11. A. 9-10. L. lat. 52.

In the older specimens the spots are more or less aggregated, those on the sides of the body forming transverse bands extending to below the lateral line.

Locality : Honolulu, Oahu.

ALBULIDÆ.

ALBULA CONORHYNCHUS, Bl. Schn. [No. 18004.]

Argentina glossodonta, FORSK., Descr. Anim., 1775, 68.

Albula conorhynchus, BLOCH, Syst. Ichth., ed. SCHN., 1801, 432.—CUV. & VAL., Hist. Nat. des Poiss., xix, 1846, 356.—GÜNTHER, Cat. Fish., vii, 1865, 468.

Butirinus glossodontus, RÜPPELL, N. W. Fische, 1837, 80, pl. 20, f. 3.—SCHLEG., Faun. Japon. Poiss., 1850, 242, pl. 109, f. 1.

Esox argenteus, FORSTER, Descr. Anim., ed. LICHT., 1844, 196.

Albula bananus, CUV. & VAL., op. cit., xix, 1846, 345.—BLEEKER, Verh. Bat. Gen., xxiv, 1852, Chiroc., 11.

Albula glossodonta, KLUNZINGER, Verh. zööl.-bot. Gesel., xxi, 1871, Fische d. Roth. Meer, 602.

Locality : Honolulu, Oahu.

MURÆNIDÆ.

MURÆNA UNDULATA, (*Lacep.*) *Gthr.* [No. 17982].

Murænophis undulata, LACEP., Hist. des Poiss., v. 1803, 629-644.

Muræna cancellata, RICHARDSON, Voy. Ereb. and Terr., Fish., 1848, 87, pl. 46, f. 1-5.—
BLEEKER, Verh. Bat. Gen., xxv, 1853, *Mur.*, 74; Nat. Tyds. Ned. Ind., v. 1853,
1853, 531; viii, 1855, 326.

Muræna valencienni, EYD. & SOUL., Voy. Bonite, Poiss., 207, pl. 8, f. 1.

Muræna agassizi, BLEEKER, Nat. Tyds. Ned. Ind., viii, 1855, 458.

Thyrsoidea cancellata, KAUP, Apod. Fish., 1856, 76, f. 59.

Gymnothorax cancellatus, BLEEKER, Atl. Ichth., iv, 1864, *Mur.*, 93, pl. 32, f. 3, pl. 33,
f. 2, pl. 39, f. 1.—KNER, Novara Exped., Fisch., 1869, 384.

Gymnothorax agassizi, BLEEKER, Atl. Ichth., iv, 1864, *Mur.*, 95, pl. 41, f. 2.

Gymnothorax blochi, BLEEKER, Atl. Ichth., iv, 1864, *Mur.*, 102, pl. 36, f. 2 (young).

Muræna blochi, BLEEKER, Verh. Bat. Gen., xxv, 1853, *Mur.*, 49; Nat. Tyds. Ned. Ind.,
vii, 1854, 102.

Muræna undulata, GÜNTHER, Cat. Fish., viii, 1870, 110.

Locality: Coral reefs at Honolulu, Oahu.

One specimen resembling Bleeker's figure 3, on plate 32 of Atlas. In another specimen the yellow lines are more interrupted and less distinctly defined, as is shown in figure 1, plate 39, of the same work.

GALEORHINIDÆ.

TRIAKIS SEMIFASCIATA, *Girard* [No. 17975].

Triakis californica, GRAY, Chondropt., 56 (No descr.).

Triakis semifasciatum, GIRARD, Proc. Acad. Nat. Sci. Phila., 1854, 196; U. S. Pac. R. R.
Rep., x, 1858, Fish., 362.

Mustelus felis, AYRES, Proc. Cal. Acad. Nat. Sci., 1854, 17.

Triakis semifasciata, GÜNTHER, Cat. Fish., viii, 1870, 384.

A row of rounded black spots along the sides of the body, alternating with transverse bands, which unite across the median line of the back. Also small round black spots between the cross-bars on the median line of the back, and others alternating with the larger spots on the sides.

Locality: North Pacific Ocean. Fœtus. The specimens were obtained in Honolulu, whither they had been brought by a whaler.

III.—Fishes of the Fanning Group.

TETRODONTIDÆ.

TETRODON IMPLUTUS, *Jenyns** [No. 19214].

Locality: Palmyra and Christmas Islands.

Specimens large, and sparsely spinous. Round bluish-white spots on the dorsal regions numerous, and the longitudinal lines on the under surface indistinct.

TETRODON NIGROPUNCTATUS, *Bl. Schn.* [No. 19215].

Tetrodon nigropunctatus, BLOCH, Syst. Ichth., ed. SCHN., 1801, 507.—GÜNTHER, Cat. Fish., viii, 1870, 293.—KLUNZINGER, Verh. zool.-bot. Ges., xxi, 1871, Fische d. Roth. Meer, 643.

Tetraodon diadematus, RÜPPELL, Atl. Fisch., 1828, 65, pl. 17, f. 3.—GÜNTHER, Cat. Fish., viii, 1870, 293.

Tetrodon trichoderma, BLEEKER, Nat. Tyds. Ned. Ind., v, 1853, Sumatra, 532.

Tetrodon trichodermatoides, BLEEKER, Nat. Tyds. Ned. Ind., vi, 1854, Flores, 336.

Arothron melanorhynchus, BLEEKER, Nat. Tyds. Ned. Ind., ix, 1855, 111.

Arothron trichoderma, BLEEKER, Enum. Pisc. Arch. Ind., 1859, 201.

Arothron trichodermatoides, BLEEKER, Enum. Pisc. Arch. Ind., 1859, 202.

Crayracion nigropunctatus, BLEEKER, Atl. Ichth., v, 1865, *Gymnod.*, 74, pl. 2, f. 4.

Locality: Fanning Group.

This specimen belongs to what Günther calls *citrinella*, a variety of *nigropunctatus*. It is characterized by its lemon color, with small scattered black spots on the sides, and large and small irregular black spots on the back; by its black dorsal fin, with a large black blotch around its base; eye-lids black, and black around the gill-openings.

OSTRACIONTIDÆ.

OSTRACION TUBERCULATUS, *Linn.* [No. 19216].

Ostracion tetragonus, LINN., Mus. Ad. Fred., 1754, 59.—BLEEKER, Atl. Ichth., v, 1865, *Ostrac.*, 39, pl. i, f. 2, pl. 3, f. 2.—GÜNTHER, Fish. Zanz., 1866, 129.

Ostracion tuberculatus, LINN., Syst. Nat., i, 1766, 409.

Ostracion cubicus, LINN., Syst. Nat., i, 1766, 410.—BLOCH, Ichth., iv, 1787, 115, pl. 137.—LACÉP., Hist. des Poiss., i, 1798, 461, pl. 22, f. 1.—RÜPPELL, Atlas Fische, 1828, 3.—BLEEKER, Verh. Bat. Gen., xxiv, 1852; *Balist. en Ostrac.*, 35, pl. 7, f. 14.—HOLLARD, Ann. Sc. Nat., vii, 1857, 162.—GÜNTHER, Cat. Fish., viii, 1870, 260.—KLUNZINGER, Verh. z.-b. Ges., xxi, 1871, 635.

Ostracion bituberculatus, BLOCH, Syst. Ichth., ed. SCHN., 1801, 501.

* See synonym under Hawaiian Fishes.

Ostracion cyanurus, RÜPPELL, Atl. Fische, 1828, 4, pl. 1, f. 2.—HOLLARD, Ann. Sc. Nat., 1857, vii, 167.

Ostracion argus, RÜPPELL, op. cit., pl. 1, f. 1.

Ostracion immaculatus, SCHLEG., Faun. Japon. Poiss., 1850, 296.—BLEEKER, Verh. Bat. Gen., xxv, 1853, Nat. Ichth. Japan, 55.

Ostracion tesserula, BLEEKER, Nat. Tyds. Ned. Ind., iii, 1852, 305 (young).

Carapace four-ridged, without spines. Body with bluish black-edged ocelli, one in the center of each scute.

Locality: Fanning Group.

BALISTIDÆ.

BALISTES ACULEATUS, Linn. [No. 19217.]

Balistes aculeatus, LINN., Syst. Nat., i, 1766, 406.—BLOCH, Ausländ. Fisch., ii, 1766, pl. 149.—BLOCH, Syst. Ichth., ed. SCHN., 1801, 465.—LACÉP., Hist. des Poiss., i, 1798, 367, pl. 17, f. 1.—BENNETT, Beechey's Voy. Zoöl., 1839, 69, pl. 22, f. 2.—JENYNS, Zoöl. Beagle, Fish., 1842, 155.—BLEEKER, Verh. Bat. Gen., xxiv, 1852, *Balist.*, 15.—HOLLARD, Ann. Sc. Nat., i, 1855, 333.—GÜNTHER, Cat. Fish., viii, 1870, 223.

Balistes ornatus, LESSON, Voy. Coq. Zoöl. Poiss., i, 1830, 119, pl. 10, f. 1.

Balistes armatus, CUV., Règne Anim. III. Poiss., 1829-'30, pl. 112, f. 2.

Balistes striatus, GRONOV., Syst. (1780), ed. GRAY, 1854, 32.

Balistes (Balistapus) aculeatus, BLEEKER, Atl. Ichth., v, 1865, 120, pl. 216, *Balist.*, pl. 2, f. 3.

Locality: Fanning Group.

PLEURONECTIDÆ.

RHOMBODICHTHYS LEOPARDINUS, Gthr. [No. 19218].

Rhomboidichthys leopardinus, GÜNTHER, Cat. Fish., iv, 1862, 43.

The posterior half of the lower eye falls vertically below the upper; the interorbital space concave, its width equaling the longitudinal diameter of the eye, and scaly only on its posterior half; anterior half naked. Brownish spots, and blue-edged ocelli scattered over the body and fins.

Locality: Fanning Group.

This species is very closely allied to *R. pantherinus*, but it may readily be distinguished by the naked anterior-half of the interocular space, and by the scattered ocelli. Günther records it without a habitat, and this is the first instance, to our knowledge, where a locality has been assigned to it.

BLENNIIDÆ.

SALARIAS QUADRICORNIS, *Cuv. & Val.* [No. 19219].

Salarias quadricornis, CUV. & VAL., Hist. Nat. des Poiss., xi, 1836, 329, pl. 329.—GÜNTHER, Cat. Fish., iii, 1861, 255.—KLUNZINGER, Verh. zööl.-bot. Ges., xxi, 1871, Fische d. Roth. Meer, 476.

D. 12 | 20. A. 21-23. V. 2.

Dorsal notched, and continued on the base of the caudal. Head crested. Tentacles over the eyes, on the sides of the neck, and at the nostrils; the latter are fringed the former are as long as the eye and those on the neck are very short. Transverse streaks arranged in pairs on the sides of the body and ascending on the dorsal fin at its base; spinous dorsal with undulating lines; the soft dorsal with oblique lines ascending backward; the anal with three fine lines, the lowest of which is discontinued anteriorly. The anterior dorsal is lower than the posterior, and both are lower than the body and higher than the anal.

Locality: Fanning Group.

SCARIDÆ.

PSEUDOSCARUS GLOBICEPS, (*Cuv. & Val.*) *Gthr.* [No. 19220].

Scarus globiceps, CUV. & VAL., Hist. Nat. des Poiss., xiv, 1839, 242.—JENYNS, Voy. Beagle, Fishes, 1842, 106.

Pseudoscarus globiceps, GÜNTHER, Cat. Fish., iv, 1862, 224; Fish. Zanz., 1866, 105.

Pseudoscarus spilonotus, KNER, Sitz. d. k. Ak. d. Wissen. Wien, lviii, i, 1868, 31, 352, pl. 9, f. 26.

A deep black ocellus on the scale covering the base of the fourth dorsal spine. Body spotted; spots principally confined to the upper and anterior parts of the body.

Locality: Fanning Group.

PSEUDOSCARUS JONESI, n. sp. [No. 19221].

D. $\frac{9}{10}$. A. $\frac{2}{9}$. L. lat. 24. L. trans. 8. Head, $3\frac{1}{2}$. Height, $3\frac{1}{2}$ in total.

Jaws greenish; lips very narrow, covering only the base of the jaws. Two series of scales on the cheeks; seven scales in the lower series; the lower præopercular limb entirely naked. Upper profile of the head convex, not gibbous. In one specimen there is a short tooth on each side at the angle of the lower jaw, but it is absent in all the rest (three). Caudal lobes slightly produced. Fourteen rays in the pectoral fin.

Color (in spirits) greenish-olive, yellowish about the mouth. A broad irregularly-outlined band across the snout, and from its extremities there passes backward a prolongation which touches the anterior margin of the orbit, and then passes along the superior border of the eye to the posterior part of the interorbital space, where it joins with its fellow of the opposite side, inclosing an irregularly-shaped triangular space on the front of the interocular region. Frequently (in smaller specimens) there is a narrow dark streak from the superior border of the orbit toward the middle of the interorbital space; this streak is sometimes reduced to rounded spots in the same situation; a short streak from the middle of the posterior margin of the eye; a band below the eye, commencing near its anterior edge, and prolonged beyond the posterior margin. Frequently two ocelli, one on either side, in front of the band on the snout, and also one behind and above the angle of the mouth; a very narrow band around the margin of the upper lip; a broad band around the lower jaw, the two halves of which scarcely meet below in the median line; it broadens above, just below the angle of the mouth, where it is directed backward; it frequently arches downward and backward in this situation. It coalesces with the narrow supramaxillary band, and in some instances a narrow band passes from it to the band across the snout. Occasionally there is an ocellus on the lower jaw, behind the marginal band. Dorsal and anal fins with a narrow band along the margin, and with one or two rows of intermarginal spots. Frequently (in young specimens) these spots are confluent transversely or longitudinally, forming either vertical streaks or longitudinal bands. Caudal with reticulating transverse bands.

Lengths, 14, 12, 11 inches.

Locality: Palmyra Island.

To William H. Jones, M. D., Surgeon, U. S. N., an indefatigable collector in natural history, and to whose zeal we are chiefly indebted for this collection, I dedicate this species, in remembrance of pleasant hours passed together as collaborators, and as messmates.

PSEUDOSCARUS ÆRUGINOSUS, Blkr. [No. 19221].

? *Scarus æruginosus*, CUV. & VAL., Hist. Nat. des Poiss., xiv, 1839, 257.

Scarus lacerta, CUV. & VAL., op. cit., 217.

Scarus æruginosus, BLEEKER, Ver. Bat. Gen., xxii, 1849, *Labr.*, *Cycl.*, 58.

Pseudoscarus æruginosus, BLEEKER, Atl. Ichth., i, 1862, *Labr.*, 40, pl. 17, f. 2—GÜNTHER, Cat. Fish., iv, 1862, 229.

Color (in spirits) greenish on the sides of the body and head, brown—
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ish above, along the back and head; three silvery longitudinal bands along the side of the abdomen; the first commencing at the lower part of the base of the pectoral fin; the third above the base of the ventrals, extending to the anal fin. Fins reddish; spinous dorsal with a very narrow darker margin.

Lengths, 8, 8, 5.50 inches.

Locality: Fanning Islands.

LABRIDÆ.

CHEILINUS UNIFASCIATUS, n. sp. [No. 19222].

D. $\frac{9}{10}$. A. $\frac{3}{4}$. L. lat. 22. L. trans. $9\frac{1}{2}$.

Height of the body three and a half times in the total length, and the length of the head from three to three and one-fifth times in the same. Snout elongated, conical, lower jaw projecting. Diameter of the eye is one-third the length of the snout, and one-half the width of the præorbital; the center of the pupil is midway between the angle of the operculum and the point of the snout. The anterior tubules of the lateral line with a single lateral branch. Two rows of scales on the cheeks; the lower series does not cover the inferior præopercular limb. Caudal fin rounded, with the upper and lower lobes very slightly produced. Body reddish (in spirits), with branching lines passing from the eye over the snout; anastomosing lines on the cheeks, extending to the margins of the sub- and inter-operculum; a yellowish streak from the inferior border of the orbit to the superior axil of the pectoral fin; and above this another streak, similar but somewhat fainter outlined, extending from the posterior border of the eye to the end of the operculum; the upper surface of the head covered with reticulated markings. A broad band from the end of the dorsal to the end of the anal fin, and continued obliquely forward on the posterior rays of the dorsal; dorsal violet, with a light margin, and a light median line. Anal less deeply tinted with violet than the dorsal; in younger specimens nearly immaculate, with a light streak along the center; rays green. Upper and lower lobes of the caudal violet, the intermediate rays deep green. Basal half of the ventrals of a deep violet.

Lengths, 8.50, 10.00, 10.50, 11.00, 11.50 inches.

Locality: Fanning Group.

This species is apparently very closely allied to *Cheilinus rhodochrous*, Gthr., which, however, is a slenderer fish, with much less depth of body. This is the most important distinction between them.

JULIS UMBROSTIGMA, Rüpp. [No. 19223].

Julis umbrostigma, RÜPPEL, N. W. Fische, ii, 1837, pl. 3, f. 2.—BLEEKER, Atl. Ichth., i, 1862, 92, pl. 34, f. 2.—GÜNTHER, Cat. Fish., iv, 1862, 185.—KNER, Fische Novara Exped., 1869, 257.—KLUNZINGER, Verh. zööl.-bot. Gesel., xxi, 1871, Fische d. Roth. Meer, 538.

Julis souleyeti, CUV. & VAL., Hist. Nat. des Poiss., xiii, 1839, 457.

Body with small blackish vertical streaks on the scales; spots scattered over the head; three or four short streaks from the upper and posterior portion of the orbit; a pair of short streaks between the eyes, and two on the upper surface of the snout; a single round spot between the two pairs; an oblique streak on each side of the snout, parallel with the upper lip; another, and shorter, streak on the side of the snout, extending downward from before the eye and coalescing with the extremity of the first. Dorsal with a black spot anteriorly between the first and third spines.

Locality: Fanning Islands.

JULIS GÜNTHERI, Bleeker [No. 19224].

Julis quadricolor, BLEEKER, Act. Soc. Sc. Indo-Nederl., i, 1856, Manad., 55.

Julis güntheri, BLEEKER, Versl. Akad. Wet. Amst., xiii, 1862, 279; Atl. Ichth., i, 1862, Labr., 94, pl. 34, f. 1.—GÜNTHER, Cat. Fish., iv, 1862, 188.

Three specimens similar in every particular, and agreeing with descriptions.

Two longitudinal denticulated bands on the sides of the body—one running from the nape of the neck, just above the anterior portion of the lateral line, to the extremity of the upper caudal lobe; the second commencing behind the angle of the operculum and extending to the middle of the caudal fin. Two curved bands on the sides of the head—one from the upper jaw, through the eye, to the angle of the operculum; the other from the under surface of the lower jaw, along the inferior border of the eye, to opposite the base of the pectoral fin; a U-shaped band across the occiput, pointing backward and downward; two slightly arched bands between the eyes, from the antero-superior and postero-superior margins, inclosing the interocular space; sometimes the extremities of these bands are united through the superior edge of the eye, forming a ring around the interorbital region; in one instance a third band crossed the center of the space between the eyes; an oblique band on the breast below the base of the pectoral fin. Dorsal fin with a black spot anteriorly; the fin with a dark margin; anal uni-

formly colored. The tip of the pectoral fin black; a black spot on the upper part of the base.

In one specimen short vertical streaks pass from one longitudinal band to the other on the sides.

Lengths, 5.50, 5.00, 4.50 inches.

Locality: Fanning Islands.

JULIS MELANOCHIR, *Bleeker*. [No. 19225].

Julis melanochir, BLEEKER, Act. Soc. Sc. Indo-Nederl., ii, 1857, Amboina viii, p. 77; Atl. Ichth. i, 1862, *Labr.*, 89, pl. 33, pl. 2.—GÜNTHER, Cat. Fish., iv, 1862, 182.

Head violet, with two narrow blue black-edged lines on the sides; one extending from the posterior border of the eye to the point of the operculum; the other from the angle of the mouth to the junction of the sub- and inter-operculum. Body green. Dorsal fin with a light edge and a dark intramarginal line; anal with a light margin. A rounded, transverse black spot across the posterior border of the pectoral fin; a black spot in the axil above.

Locality: Fanning Islands.

JULIS LUNARIS, (*L.*) *Cuv. & Val.* [No. 19226].

Labrus lunaris, LINN., Syst. Nat. i, 1766, 474.

Scarus gallus, FORSK., Descr. Anim., 1775, 26.

Labrus viridis, BLOCH, Ausländ. Fische, v, 1786, 129, pl. 232.

Julis porphyrocephala, BENNETT, Proc. Comm. Zool. Soc., ii, 183.

Julis duperrei, QUOY & GAIM., Voy. Uran. Zool., 1824, 268, pl. 56, f. 2.

Julis lunaris, CUV. & VAL., Hist. Nat. des Poiss., xii, 1839, p. 409.—BLEEKER, Verh. Bat. Gen., xxii, 1849, *Labr.*, 28; Atl. Ichth., i, 1862, *Labr.*, 90, pl. 33, f. 5.—GÜNTHER, Cat. Fish., iv, 1862, 180; Fish. Zanz., 1866, 97.—KNER, Fische Novara Exped., 1869, 256.—KLUNZINGER, Verh. zool.-bot. Ges., xxi, 1871, Fische d. Roth. Meer, 535.

Julis viridis, CUV. & VAL., op. cit., 420.

Julis meniscus, CUV. & VAL., op. cit., 415.

Julis martensii, CUV. & VAL., op. cit., 421.

Julis trimaculatus, RÜPPELL, N. W. Fische, 1837, 13.

Julis celebicus, BLEEKER, Nat. Tyds. Ned. Ind., ix, 1855, Celebes, viii, 313.

Julis lutescens (SOLANDER), BENNETT, Zool. Beechey's Voy. Fishes, 1839, 65, pl. 19, f. 2.

Caudal lobes much produced; the second ray of the ventral fin prolonged.

Head violet, with two or three streaks from the hinder margin of the eye, deflexed obliquely across the operculum; a curved band on the side of the head below the eye. Body green, with a vertical streak at the base of each scale. Dorsal and anal fins with dark base and light margin. A longitudinal oblong black spot on the upper part of the pectoral fin.

Locality: Fanning Islands.

JULIS ANEITENSIS, *Gthr.* [No. 19227].

Julis aneitis, GÜNTHER, Cat. Fish, iv, 1862, 183.

Height equals the length of the head, and one-fourth of the total length (caudal lobes not included). Colors (in spirits), bluish on the shoulder; no light cross-band behind the pectorals; bands on the side of the head; two behind the eye, the upper extending to the origin of the lateral line, and the second from the middle of the posterior border of the eye to the point of the operculum; a third from above the angle of the mouth, across the lower border of the eye, to opposite the base of the pectoral fin; a curved band on the cheek below the eye, commencing on the edge of the suboperculum, turning upon itself behind the angle of the mouth, and terminating on the interoperculum. Body, greenish; each scale with a vertical streak. A broad oblique black band across the posterior half of the pectoral fin, and a black spot in the axil above. Dorsal fin with a broad light margin, and an intramarginal band, edged with a fine black line above and below; the lower line is very near the base of the fin; a black spot anteriorly on the dorsal between the second and third spines. Anal light colored, base dark; the dark portion limited by a fine black line similar to those on the dorsal.

Locality: Fanning Islands.

This species is apparently very closely allied to *Julis hebreica*, and is probably an eastern representative of that species.

GOMPHOSUS UNDULATUS, n. sp. [No. 19228].

D. $\frac{8}{13}$. A. $\frac{2}{11}$. L. lat. 27. L. trans. $\frac{3}{9}$.

Height of the body $4\frac{1}{2}$ times in the total length, and the length of the head $2\frac{1}{2}$ times in the same. Caudal fin truncated; lobes very slightly produced. Color in spirits: Head brownish-olive; a broad irregular band from the snout through the lower part of the eye to the operculum. Body glaucous-olive, lighter on the breast, and with a vertical purplish streak at the base of each scale on the sides. Dorsal and anal fins with narrow transparent margins; the former with a median row of irregularly-shaped light spots; the other portion of the fin purplish; from the upper margin of the purple portion slender, tooth-like streaks extend upward into the transparent margin between the rays. Anal with a narrow purplish band along the base, with its margin dentated; a band of the same color along the center, the upper margin of which is scalloped, and from the lower margin are tooth-like streaks similar to

those on the dorsal. A blackish transverse streak across the posterior part of the pectoral fin, and a black spot above on the base.

Length, 9 inches.

Locality: Fanning Islands.

Allied to *G. varius*, the principal difference between them being the markings on the vertical fins.

POMACENTRIDÆ.

GLYPHIDODON SEPTEMFASCIATUS, (C. & V.) Gthr. [No. 19229].

Glyphisodon septemfasciatus, CUV. & VAL., Hist. Nat. des Poiss., v, 1830, 463.—BLEEKER, Nat. Tyds. Ned. Ind., iii, 1852, Sumatra, i, 582.

Glyphidodon septemfasciatus, GÜNTHER, Cat. Fish., iv, 1862, 40.

$$D. \frac{13}{12-13} \quad A. \frac{2}{12-13} \quad L. \text{ lat. } 29. \quad L. \text{ trans. } \frac{3}{17}.$$

Scales between the eyes do not reach as far forward as the anterior border of the orbit. Seven transverse bands on the side of the body, broader than the spaces between them; the first and second band situated in front of the commencement of the spinous dorsal fin; third, fourth, and fifth bands under the spinous dorsal; sixth under the soft dorsal; seventh on the caudal peduncle behind the dorsal and anal fins. Upper half of the spinous dorsal blackish; caudal lobes tipped with black.

Locality: Palmyra Island.

GLYPHIDODON SORDIDUS, (Forst.) Gthr. [No. 19230].

Chatodon sordidus, FORST., Deser. Anim., 1775, 62, no. 87.—BLOCH, Syst. Ichth., ed. SCHN., 1801, 230.

Pomacanthus sordidus, LACÉP., Hist. des Poiss., iv, 1803, 519.

Glyphisodon sordidus, RÜPPELL, Atl. Fische, 1828, 34, pl. 8, f. 1.—CUV. & VAL., Hist. Nat. des Poiss., v, 1830, 406.—BLEEKER, Verh. Bat. Gen., xxi, 1846, Labr., Cten., 16.

Glyphidodon sordidus, GÜNTHER, Cat. Fish., iv, 1862, 41.

Scales between the eyes extend forward to the anterior border of the orbit. Six cross-bands on the body. A large round black spot above on the caudal peduncle, behind the dorsal fin.

Locality: Palmyra Island. Found in company with *G. septemfasciatus*.

ACANTHURIDÆ.

ACANTHURUS BLOCHII, C. & V.* [No. 19231].

Locality : Fanning Islands. All old specimens.

ACANTHURUS TRIOSTEGUS (L.) Bl. Schn. [No. 19232].

Chatodon triostegus, LINN., Syst. Nat., i, 1766, 463.*Acanthurus triostegus*, BLOCH, Syst. Ichth., ed. SCHN., 1801, 215.—CUV. & VAL. Hist. Nat. des Poiss., x, 1835, 197.—BLEEKER, Verh. Bat. Gen., xxiii, 1850, *Teuth.*, 13.—JENYNS, Voy. Beagle, Fishes, 1842, 75.—GÜNTHER, Cat. Fish., iii, 1861, 337; Jour. Mus. Godeff., ii, 1875, Fische der Sudsee, i, 108.*Harpagus fasciatus*, FORST., Descr. Anim., ed. LICHT., 1844, 216.*Acanthurus zebra*, LACÉP., Hist. des Poiss., iv, 1803., 546, pl. 6, f. 2.*Chatodon zebra*, LACÉP., op. cit., iii, pl. 25, f. 3.*Chatodon couagga*, LACÉP., op. cit., iv, 727.*Acanthurus hirudo*, BENNETT, Fish. of Ceylon, 1834, 11, pl. 11.

Locality : Fanning Islands.

ACANTHURUS ACHILLES, Shaw [No. 19233].

Acanthurus achilles, SHAW, Zool., iv, 1803, 383.—CUV. & VAL., Hist. Nat. des Poiss., x, 1835, 218.—GÜNTHER, Cat. Fish., iii, 1861, 340; Jour. Mus. Godeff., ii, 1875, Fische der Sudsee, i, 115, pl. 71, f. B.

$$D. \frac{9}{30-31}. \quad A. \frac{2}{28}.$$

Color (in spirits) blackish-brown; a large triangular spot, with a rounded base, on the posterior part of the side of the body, with the apex of the triangle embracing the lateral spine (spot red in life); a narrow bluish margin to the dorsal and anal fins; a narrow band along the base of each (red in life); a blue band around the lower jaw; the subopercular margin with a white spot (blue in life); and the outer rays of the ventral fins blue; margin of the caudal fin white; a crescent across the middle portion of the latter separated from the light margin by a narrow brown band.

Locality : Fanning Islands.

* See synonymy under Hawaiian Fishes.

CHÆTODONTIDÆ.

CHÆTODON SETIFER, Bl. [No. 19234].

Chatodon setifer, BLOCH, Naturg. ausländ. Fische. 1797, pl. 426, 1.—BLOCH, Syst. Ichth., ed. SCHN., 1801, 225.—CUV. & VAL., Hist. Nat. des Poiss., vii, 1831, 76.—GÜNTHER, Cat. Fish., ii, 1860, 6; Jour. Mus. Godeff., ii, 1874, Fische der Sudsee, i, 36, pl. 26, f. B.

Pomacentrus filamentosus, LACÉP., Hist. des Poiss., iv, 1803, 506, 511.

Chatodon sebanus, CUV. & VAL., op. cit., 74.

Chatodon auriga, var. RÜPPELL, N. W. Fische, 1837, 28.

Chatodon lunaris, GRONOV., Syst. (1780), ed. GRAY, 1854, 70.

Chatodon auriga, BLEEKER, Nat. Tyds. Ned. Ind., v, 1853, Celebes, iv, 164.

Locality: Fanning Islands.

CARANGIDÆ.

CARANGUS ASCENSIONIS, (Forst.) Streets [No. 19235].

Scomber ascensionis, FORSTER, Descr. Anim., ed. LICHT., 1844, 412.—BLOCH, Syst. Ichth., ed. SCHN., 1801, 33.

Caranx ascensionis, CUV. & VAL., Hist. Nat. des Poiss., ix, 1833, 102, pl. 249.—GÜNTHER, Cat. Fish., ii, 1860, 432; Jour. Mus. Godeff., 1876, part xi, Fische der Sudsee, part v, 132, pl. 85.

D $8\frac{1}{2}$. A. $2\frac{1}{7}$. L. lat. (plates) 30.

The height of the body is one-third of the total length (without caudal); head higher than long; its length is contained $3\frac{1}{2}$ times in the total length (without caudal); diameter of the eye is two-thirds of the length of the snout, and is contained $4\frac{1}{2}$ times in the length of the head. Upper maxillary extends to the vertical from the center of the eye. Occipital crest much elevated; forehead in front of the eyes concave. Teeth enlarged in the upper jaw anteriorly. The arched portion of the lateral line equals the length of the head, and is about two-thirds of the length of the straight portion. The line becomes straight below the third ray of the second dorsal fin. Pectoral fin scythe-shaped; the upper rays much produced, and extending beyond the origin of the anal. Color (in spirit) uniform brownish; vertical fins somewhat darker, and purplish.

Total length, 15.50 inches.

Locality: Fanning Islands.

CHORINEMUS SANCTI PETRI, *Cuv. & Val.** [No. 19236].

Adult specimens, 18–19 inches long. Two rows of blackish round spots on the sides, one above and the other below the lateral line; a blackish streak from above the eye to the shoulder, above the base of the pectoral fin. Top of the dorsal fin black; a black spot on the anal anteriorly.

Locality: Christmas Island. Abundant. Swim near the surface of the water.

MULLIDÆ.

MULLOIDES FLAVOLINEATUS, (*Lacép.*) *Blkr.* [No. 19237].

Mullus flavolineatus, LACÉP., Hist. des Poiss., iii, 1803, 406.

Mullus aureovittatus, SHAW, Zööl., iv, 1803, 618.

Upeneus flavolineatus, CUV. & VAL., Hist. Nat. des Poiss., iii, 1829, 456.—RÜPPELL, N. W. Fisch., 1837, 101, pl. 26, f. 1.—JENYNS, Zööl. Beagle, Fish., 1842, 24.

Mulloidés flavolineatus, BLEEKER, Nat. Tyds. Ned. Ind., iii, 1852, Ceram, ii, 697.—GÜNTHER, Cat. Fish., i, 1859, 403; Jour. Mus. Godeff., ii, 1873, Fische der Südsee, i, 56.

A broad yellow band below the middle of the body from the operculum to the tail; yellow lines on the snout; fins without spots.

Length, 11 inches.

Locality: Fanning Islands.

BERYCIDÆ.

HOLOCENTRUM SPINIFERUM, (*Forsk.*) *Gthr.* [No. 19238].

Sicæna spiniferum, FORSK., Descr. Anim., 1775, 49.

Percæ spiniferum, BLOCH, Syst. Ichth., ed. SCHN., 1801, 86.—LACÉP., Hist. des Poiss., iv, 1803, 418.

Holocentrum leo, CUV. & VAL., Hist. Nat. des Poiss., iii, 1829, 204.—LESSON, Voy. Coq., ii, 1830, 222.—QUOY & GAIM., Voy. Astrol. Poiss., 1834, 678, pl. 14, f. 3.—CUVIER, Règne Anim. Ill., pl. 14, f. 1.—BLEEKER, Nat. Tyds. Ned. Ind., vii, 1854, Kokos-eil., 355.

Holocentrus spinifer, RÜPPELL, N. W. Fische, 1837, 96, pl. 25, f. 1.

Holocentrum spiniferum, GÜNTHER, Cat. Fish., i, 1859, 39; Jour. Mus. Godeff., ii, 1874, Fische der Südsee, i, 94.

The profile of the head concave; snout pointed, longer than the diameter of the eye; the end of the maxillary extends to under the anterior portion of the eye. Posterior border of the præoperculum oblique, dentated, the long spine at the angle longer than one-half of the

* See synonymy under Hawaiian Fishes.

posterior border ; two flat opercular spines, the upper the larger ; margin serrated ; suboperculum entire ; interoperculum serrated above only ; scapular dentated. The third anal spine as long as the longest dorsal spine. Color, red.

Locality : Fanning Islands.

PRISTIPOMATIDÆ.

APHAREUS FURCATUS, (Lacép.) Gthr. [No. 19239].

Labrus furcatus, LACÉP., Hist. des Poiss., iii, 1803, 424, 477, pl. 21, f. 1.

Caranxamorus sacerstinus, LACÉP., op. cit., v, 1803, 682.

Aphareus cærulescens, CUV. & VAL., Hist. Nat. des Poiss., vi, 1830, 487, pl. 167b.

Aphareus furcatus, GÜNTHER, Cat. Fish., i, 1859, 326 ; Jour. Mus. Godeff., ii, 1873, Fische der Sudsee, i, 17.

D. $\frac{10}{11}$. A. $\frac{3}{8}$. L. lat. 76. L. trans. $\frac{8}{13}$.

The third dorsal spine is the longest. The last ray of the dorsal and anal fins is three times as long as the preceding rays.* Brown (in spirits). darker above the lateral line ; head brownish-blue.

Length, 13 inches.

Locality : Fanning Islands.

LUTJANUS LINEATUS, (Q. & G.) Streets [No. 19240].

Diacope lineata, QUOY & GAIMARD, Voy. Freyc., Zoöl., 1824, 309.

Diacope striata, CUV. & VAL., Hist. Nat. des Poiss., ii, 1828, 430.

Mesoprion striatus, BLEEKER, Verh. Bat. Gen., xxii, 1849, *Percidae*, 44.

Mesoprion janthinuropterus, BLEEKER, Nat. Tyds. Ned. Ind., iii, 1852, Celebes, iii, 751.

Mesoprion lineatus, GÜNTHER, Cat. Fish., i, 1859, 193.

D. $\frac{10}{13}$. A. $\frac{3}{8}$. L. lat. 50.

The height of the body equals the length of the head, and is contained $3\frac{1}{2}$ times in the total length ; the diameter of the eye is slightly less than one-fifth of the length of the head. Præoperculum finely denticulated ; coarser teeth at the angle ; a shallow notch above the angle. The fourth and fifth dorsal spines are the longest. Caudal emarginate,

Olive, darker above, with oblique brown lines above the lateral line, and longitudinal ones below ; no lateral blotch. Dorsal and caudal fins blackish ; spinous dorsal with a narrow, deeper black margin ; anal and ventrals blackish ; a large blackish spot, spreading over the base of the rays, in the axil of the pectoral fin.

Locality : Christmas Island. Very abundant.

* Günther, in Cat. Fishes, states that it is but twice as long. This is probably a typographical error.

SERRANIDÆ.

EPINEPHELUS URODELUS, (*Forst.*) *Bleeker* [No. 19241].

Perca urodela, FORSTER, Descr. Anim., ed. LICHT., 1844, 221.

Serranus urodelus, CUV. & VAL., Hist. Nat. des Poiss., ii, 1828, 306; vi, 1830, 513.—BLEEKER, Nat. Tyds. Ned. Ind., vii, 1854, Kokos-eil., 39.—GÜNTHER, Cat. Fish., i, 1859, 122; Jour. Mus. Godeff., ii, 1873, Fische der Sudsee, i, p. 3, pl. 3, f. A.

$$D. \frac{9}{14-15} \quad A. \frac{3}{8-9}$$

Uniform brown (in spirits). The posterior part of the dorsal and anal, and caudal fins, with white spots; a narrow black margin to the soft dorsal and anal, and a submarginal band of white; caudal with two oblique white lines, converging posteriorly.

Locality: Fanning Islands.

EPINEPHELUS ARGUS, (*Bl. Schn.*) *Bleeker* [No. 19242].

Bodianus guttatus, BLOCH, Ausländ. Fische, vii, 1797, pl. 224.—BLOCH, Syst. Ichth., ed. SCHN., 1801, 330.

Cephalopholis argus, BLOCH, Syst. Ichth., ed. SCHN., 311, pl. 61.

Serranus myriaster, CUV. & VAL., Hist. Nat. des Poiss., ii, 1828, 365.—RÜPPEL, Atlas Fische, 1828, 107, pl. 27, f. 1.—LESSON, Voy. Coq. Poiss., 1830, pl. 37.

Serranus argus, CUV. & VAL., op. cit., ii, 1828, 360.—GÜNTHER, Cat. Fish., i, 1859, 115.

Serranus guttatus, PETERS, Arch. f. Naturg., 1855, i, 235.—GÜNTHER, op. cit., i, 1859, 119; Jour. Mus. Godeff., ii, 1873, Fische der Sudsee, i, 5, pl. 4. (non CUV. & VAL.)

$$D. \frac{9}{15-16} \quad A. \frac{3}{9}$$

Brownish-black; head, body and, fins covered with round blue black-edged spots; more or less distinctly-marked transverse bars across the posterior portion of the body; the soft portion of the dorsal, the anal, the pectoral, and the caudal fins with narrow white margins; the upper half of the membrane, between the dorsal spines, light colored.

Locality: Christmas Island.

The name *guttatus* cannot be retained for this species, as an Atlantic species, the *Perca guttata*, Gmelin (= *Epinephelus guttatus*, Goode), has a prior claim to it.

EPINEPHELUS HEXAGONATUS, (*Bl. Schn.*) *Bleeker*. [No. 19243].

Holocentrus hexagonatus, BLOCH, Syst. Ichth., ed. SCHN., 1801, 323.

Serranus hexagonatus, CUV. & VAL., Hist. Nat. des Poiss., ii, 1828, 330; vi, 1830, 516.—

RICHARDSON, Voy. Sulph., 1844, 82, pl. 38, f. 1.—BLEEKER, Nat. Tyds. Ned. Ind., vi, 1854, 191.—GÜNTHER, Cat. Fish., i, 1859, 140; Jour. Mus. Godeff., ii, 1873, Fische der Sudsee, i, 7, pl. 7.

Serranus forcatus, CUV. & VAL., op. cit., ii, 1828, 329.

Serranus stellans, RICHARDSON, Ann. Nat. Hist., 1842, ix, 23.

Perca hexagonata, FORSTER, Deser. Anim., ed. LICHT., 1844, 189.

$$D. \frac{11}{15-16}. \quad A. \frac{3}{8}.$$

Brownish; covered all over with hexagonal spots, separated by white lines; four large dark brown blotches on the back along the base of the dorsal fin.

Locality: Christmas Island.

VARIOLA LOUTI, (*Forsk.*) *Bleeker*. [No. 19244].

Perca louti, FORSKÅL, Deser. Anim., 1775, 40.

Labrus punctatus, LACÉP., Hist. des Poiss., iii, 1803, 377, pl. 17, f. 2.

Bodianus louti, BLOCH, Syst. Ichth., ed. SCHN., 1801, 332.—LACÉP., op. cit., iv, 1803, 236.

Serranus punctulatus, CUV. & VAL., Hist. Nat. des Poiss., ii, 1828, 367; ix, 1833, 435.

Serranus louti, RÜPPELL, Atlas Fische, 1828, 106, pl. 26, f. 2.—GÜNTHER, Cat. Fish., i, 1859, 101; Jour. Mus. Godeff., ii, 1873, Fische der Sudsee, i, 2, pl. 1 (non Val).

Variola longipinna, SWAINSON, Nat. Hist., ii, 1839, 202.

Pseudoserranus louti, KLUNZINGER, Fische d. Roth. Meer, 687.

$$D. \frac{9}{14-15}. \quad A. \frac{3}{8-9}.$$

Caudal lobes prolonged; dorsal, anal, and ventral fins produced posteriorly. Reddish (in spirits), covered all over with bluish spots, which are round on the head and fins, and linear on the body; hinder margin of the dorsal, the anal, and the caudal fin light colored.

Locality: Christmas Island.

ECHENEIDIDÆ.

ECHENEIS REMORA, *Linn.** [No. 19245].

Locality: Washington Island. Taken from the body of a captured shark.

* See synonymy under Californian Fishes.

MUGILIDÆ.

MUGIL CRENILABRIS, *Forskål* [No. 19246].

Mugil crenilabris, FORSKÅL, *Descr. Anim.*, 1775, 73.—RÜPPELL, *N. W. Fische*, 1837, 132.—CUV. & VAL., *Hist. Nat. des Poiss.*, xi, 1836, 123.—GÜNTHER, *Cat. Fish.*, iii, 1861, 458.

Mugil rüppelli, GÜNTHER, *Cat. Fish.*, iii, 1861, 458.

D $4\frac{1}{8}$. A $3\frac{3}{8}$. L. lat. 38–40. L. trans. 14.

Height of the body is contained $4\frac{1}{2}$ times in the total length, and the length of the head 5 times in the same. Snout broad, short—less than the diameter of the eye—obtuse; the interorbital space slightly convex, its width being double the vertical diameter of the eye, and contained $2\frac{1}{4}$ times in the length of the head. The upper lip is thick, with short, fleshy fringes; the lower jaw also fringed, and notched at the symphysis; the mandibular bones do not leave any free space between them below; the præorbital notched anteriorly, and toothed posteriorly; the extremity does not entirely cover the end of the maxillary. Eyes without an adipose membrane. The second dorsal and anal fins scaly; the anterior dorsal spines one-half the length of the head. Caudal forked. The eleventh, the twelfth, and the twenty-third scales of the lateral line correspond to the extremity of the pectoral, and to the origins of the first and second dorsal fins. Sides silvery, darker along the back; a black spot superiorly in the axil of the pectoral.

Length, 6 inches.

Locality: Lagoons of Christmas Island.

MURÆNIDÆ.

MURÆNA PICTA, *Ahl* [No. 19247].

Muræna picta, J. N. AHL, de *Muræu. et Ophichth.*, in Thunberg's *Dissert.*, iii, 1793, 6, pl. 2, f. 2.—PLAYFAIR & GÜNTHER, *Fish. Zanz.*, 1866, 126.—GÜNTHER, *Cat. Fish.*, viii, 1870, 116.

Gymnothorax pictus, BLOCH, *Syst. Ichth.*, ed. SCHN., 1801, 529.—BLEEKER, *Atl. Ichth.*, iv, 1864, 87, pl. 170, f. 3, 4, pl. 172, f. 3, pl. 173, f. 1, pl. 189, f. 3.—KNER, *Fisch. Novara Exped.*, 1869, 384.

Murænophis pantherina, LACÉPÈDE, *Hist. des Poiss.*, v, 1803, 628, 641, 643.

Muræna variagata, QUOY & GAIMARD, *Voy. Uran.*, Poiss., 1824, pl. 52, f. 1.

Muræna lita, RICHARDSON, *Zoöl. Voy. Ereb. & Terr.*, Fish., 1846, 84.—BLEEKER, *Nat.*

Tyds. Ned. Ind., iii, 1852, 294; x, 1856, 283; *Verh. Bat. Gen.*, xxv, 1853, *Muræn.*, 47.

Muræna sidera, RICHARDSON, *op. cit.*, 85, pl. 48, f. 1–5.

Murana pfeifferi, BLEEKER, Nat. Tyds. Ned. Ind., v, 1853, 173; Verh. Bat. Gen., xxv, 1853, *Murana*, 72.

Sidera pfeifferi, KAUP, Cat. Apod. Fish., 1856, 71.

Sidera pantherina, KAUP, op. cit., 1856, 71.

Gymnothorax pantherinus, BLEEKER, Ned. Tydschr. Dierk., i, 1863, 152.

Locality: Palmyra Island. The collection contains many specimens, illustrating all the variations of color-markings of this variable species. All the teeth, except the anterior mandibulary, are uniserial in their arrangement. One specimen, six inches long, presents all the details of coloration of *Murana polyophthalma*, but differs from it in its dentition.

GALEORHINIDÆ.

CARCHARIAS MELANOPTERUS, Q. & G. [No. 19248].

Carcharias melanopterus, QUOY & GAIMARD, Voy. Uran. Zool., 1824, 194, pl. 43, f. 1-2.—RÜPPELL, N. W. Fische, 1837, 63.—GÜNTHER, Cat. Fish., viii, 1870, 369.

Carcharias (Prionodon) melanopterus, MÜLLER & HENLE, 43, pl. 19, f. 5.—BLEEKER, Verh. Bat. Gen., xxiv, 1852, *Plag.*, 33.—DUMERIL, Elasmobr., 365.

Carcharias (Prionace) melanopterus, CANTOR, Mal. Fish., 400.

Carcharias (Prionodon) heulei, BLEEKER, Nat. Tyds. Ned. Ind., iv, 1853, 507.

Carcharias (Prionodon) brachyrhynchus, BLEEKER, Act. Soc. Sc. Indo-Néerl., vi, 1859, 206.—DUMERIL, Elasmobr., 364.

Localities: Christmas and Washington Islands. Young and fœtus. Gray, with all the fins of the body tipped with black.

IV.—Fishes from the Samoan Islands, collected by A. B. Steindler.

OSTRACIONTIDÆ.

OSTRACION PUNCTATUS, Bl. Schn. [No. 15130].

Ostracion pointillé, LACÉPÈDE, Hist. des Poiss., i, 1793, 442, 445, pl. 21, f. 1.

Ostracion punctatus, BLOCH, Syst. Ichth., ed. SCHN., 1801, 501.—JENYNS, Zool. Beagle, Fish., 1842, 153.—BLEEKER, Nat. Tyds. Ned. Ind., xi, 1856, 108; Atl. Ichth., v, 1865, 39, pl. 202, *Ostrac.*, pl. 2, f. 4.—HOLLARD, Ann. Sc. Nat., vii, 1857, 167.—GÜNTHER, Cat. Fish., viii, 1870, 261.—PLAYFAIR & GÜNTHER, Fish. Zanz., 1866, 130.

Ostracion lentiginosus, BLOCH, Syst. Ichth., ed. SCHN., 1801, 501.

Ostracion meleagris, SHAW, Gen. Zool., v, 1804, 423, pl. 172; Nat. Misc., 7, pl. 253.

The entire body covered with small white spots, which are confluent into undulating lines on the under surface of the body, and under the eyes.

BALISTIDÆ.

BALISTES ACULEATUS, *Linn.** [No. 15138].

Young specimen. Two and a half inches long.

GOBIIDÆ.

BRACHYELEOTRIS CYANOSTIGMA, *Blkr.†* [No. 15115].

Similar in every respect, even to the presence of the rudimentary spines on the præoperculum, to those described from the Hawaiian Islands.

GOBIUS ECHINOCEPHALUS, *Rüpp.* [No. 15113].

Gobius echinocephalus, RÜPPELL, Alt. Fische, 1828, 136; N. W. Fische, 1837, 137, 138.—CUV. & VAL., Hist. Nat. des Poiss., xii, 1837, 134.—GÜNTHER, Cat. Fish., iii, 1861, 34.—KLUNZINGER, Verh. zoöl.-bot. Gesel., xxi, 1871, 475.

Gobius amiciensis, CUV. & VAL., op. cit., xii, 1837, 135.—GÜNTHER, op. cit., iii, 1861, 35.—KNER & STEINDACHNER, Sitz. d. k. Ak. d. Wissen., Math.-Naturwissen. Classe, liv, i, 1866, 367.

D. $6\frac{1}{10}$. A. $\frac{1}{9}$. L. lat. 23-24. L. trans. 8.

Height of the body one-fourth of the total length. Head as high as long, very obtuse in front; cleft of mouth nearly vertical. The outer series of teeth in both jaws enlarged; in the lower jaw in front, on either side of the symphysis, and behind the other teeth of the jaw, is a large canine tooth, curved backward. Head and vertex, to the commencement of the first dorsal fin, naked; cheeks swollen, and together with the under surface of the head, covered with small warts and short cirri. Gill-openings narrow, of the same length as the base of the pectoral fin. Ventrals subcircular; caudal rounded. Body light brown; head somewhat lighter; fins dark brown.

GOBIODON CITRINUS, (*Rüpp.*) *Gthr.* [No. 15114].

Gobius citrinus, RÜPPELL, N. W. Fische, 1837, 139, pl. 32, f. 4.

Gobiodon citrinus, GÜNTHER, Cat. Fish., iii, 1861, 87.—KLUNZINGER, Verh. zoöl.-bot. Gesel., xxi, 1871, 480.

Head and body compressed; head rounded, very obtuse in front. Scales none. No canine teeth. Yellow, with a blue black-edged streak

* See synonymy under Fishes from Fanning Islands.

† See synonymy under Hawaiian Fishes.

along the base of the dorsal and anal fins; two similar, but vertical, streaks through and below the eye; another in front of the pectoral fin, commencing above, and terminating on the base. The first dorsal with a narrow, black margin. All the specimens were enveloped in a thick mucous covering, which completely obscured the markings of the body.

GOBIODON CERAMENSIS, (Blkr.) Gthr. [No. 19250].

Gobius ceramensis, BLEEKER, Nat. Tyds. Ned. Ind., iii, 1852, Ceram, ii, 704.

Gobiodon ceramensis, GÜNTHER, Cat. Fish., iii, 1861, 83.

D. $6\frac{1}{16}$. A. $\frac{1}{8}$.

Scales none. Height of the body is contained $3\frac{1}{2}$ times in the total length, and the length of the head $4\frac{1}{2}$ times in the same. Head and body compressed, the former as high as long; eyes close together; the profile of the snout descends nearly vertically from between the eyes. Lower jaw with canine teeth in front, behind the outer band. Caudal rounded. Brown, with blackish fins.

SCORPÆNIDÆ.

SEBASTOPSIS GUAMENSIS, (Q. & G.) [Nos. 15106, 15136].

Scorpena guamensis, QUOY & GAIMARD, Voy. Uran. Zoöl., 1824, 326.—GÜNTHER, Jour.

Mus. Godeffr., ii, 1874, Fische der Sudsee, i, 74, pl. 56, f. B.

Scorpana rubropunctata, CUV. & VAL., Hist. Nat. des Poiss., iv, 1829, 324.

Sebastes minutus, CUV. & VAL., op. cit., iv, 1829, 348.—GÜNTHER, Cat. Fish., ii, 1860, 106.

Scorpana chilioprsta, RÜPPELL, N. W. Fische, 1837, 107, pl. 27, f. 3.—GÜNTHER, Cat. Fish., ii, 1860, 121.

Scorpana polylepis, BLEEKER, Nat. Tyds. Ned. Ind., ii, 1851, 173.

Sebastes polylepis, GÜNTHER, Cat. Fish., ii, 1860, 106.

D. $11-12\frac{1}{2}$. A. $\frac{3}{5}$. L. lat. 42.

Height of the body is one-third of the total length (without caudal), and the length of the head is about two-fifths of the same. No teeth on the palatine bones. Occiput scaly; scales extending to the groove between the eyes. Diameter of the eye equals the length of the snout, and is twice the width of the interorbital space. The end of the maxilla extends beyond the vertical from the center of the eye. Eleven simple rays in the pectoral fin. The fifth to the eighth dorsal spines the longest, more than one-third of the length of the head. No cutaneous appendages. Light brown, marbled with dark brown; a large, rounded, blackish spot on the operculum.

POMACENTRIDÆ.

DASYLLUS ARUANUS, (L.) C. & V. [No. 15104].

Chatodon aruanus, LINN., Syst. Nat., i, 1766, 464.—BLOCH, Ausländ. Fische, iii, 1787, 62, pl. 198, f. 2.—BLOCH, Syst. Ichth., ed. SCHN., 1801, 220.—SHAW, Gen. Zool., iv, 1803, 348.

Chatodon abu dafur, FORSKÅL, Descr. Anim., 1775, 15.

Lutjanus aruanus, LACÉP., Hist. des Poiss., iv, 1803, 720.

Pomacentrus aruanus, RÜPPEL, Atl. Fische, 1828, 39.

Dasyllus aruanus, CUV. & VAL., Hist. Nat. des Poiss., v, 1830, 434.—GÜNTHER, Cat. Fish., iv, 1862, 12.

Chatodon araneus, BENNETT, Fish of Ceylon, 1837, pl. 17.

Tetradrachmum arcuatum, CANT., Mal. Fish., 241.

Body with three black cross-bands, extending on the dorsal and anal fins; the first descends obliquely from the commencement of the spinous dorsal, through the eye, to the chin, leaving a round, greyish space between the eyes; the second band is bowed, and extends from the middle of the spinous dorsal to the ventral fins; the third from the posterior part of the soft dorsal to the anal fin. Ventrals black; caudal white. Anus black.

CHROMIS LEPIDURUS, (C. & V.) Streets [No. 15116].

Heliastes lepidurus, CUV. & VAL., Hist. Nat. des Poiss., v, 1830, 498.—GÜNTHER, Cat. Fish., iv, 1862, 63.

Heliastes frenatus, CUV. & VAL., op. cit., v, 1830, 498.—GÜNTHER, op. cit., iv, 1862, 62.

D. $\frac{12}{10}$. A $\frac{2}{10}$. L. lat. 27. L. trans. $\frac{1}{8}$ ².

Height of the body is one-half of the total length (without caudal), and the length of the head is contained about three times in the same. But one distinct series of conical teeth. The diameter of the eye longer than the snout, and is contained about two and two-thirds times in the length of the head. Caudal fin forked, and its basal half scaly. Cerulean; silvery on the breast and lower part of the head; a bluish-white streak from the eye to the snout; fins minutely punctate; pectoral yellowish, a black spot in the axil above.

One specimen, larger than the others (1.20 inches), of a brownish-metallic luster, with some scattered blue spots on the sides.

Bull. N. M. No. 7—7

GLYPHIDODON ANTJERIUS, (C. & V.) Gthr. [No. 15117].

Glyphisodon antjerius, CUV. & VAL., Hist. Nat. des Poiss., v, 1830, 481.—BLEEKER Nat. Tyds. Ned. Ind., viii, 1855, Kokos, iv, 454.

Glyphisodon biocellatus, CUV. & VAL., op. cit., v, 1830, 482.—QUOY & GAIM., Voy Uran. Zööl., 1824, 389.—BLEEKER, op. cit., viii, 1855, Sumatra, ii, 236.—LESSON, Voy. Coq. Zööl., Poiss., 1830, 188.

Glyphisodon zonatus, CUV. & VAL., op. cit., v, 1830, 483.

Glyphisodon punctulatus, CUV. & VAL., op. cit., v, 1830, 484.

Glyphidodon antjerius, GÜNTHER, Cat. Fish., iv, 1862, 50.

D. $\frac{13}{13}$. A. $\frac{2}{13}$. L. lat. 26.

Var. γ of Günther. Ground-color brownish, every scale on the body with one or more blue spots; similar spots on the fins; a blue streak from the middle of the snout, where it joins with its fellow of the opposite side, along the upper margin of the eye to the base of the anterior portion of the spinous dorsal; a short streak along the upper part of the eye, and one through the eye below the pupil to the upper jaw; a streak around the lower margin of the orbit, and still another below this on the cheek; a large, black, blue-edged ocellus on the posterior spines of the dorsal fin, extending on the back; a similar ocellus, but smaller, on the base of the posterior rays of the soft portion of the dorsal, extending on the upper part of the caudal peduncle.

Var. δ . A blue transverse band from the sixth dorsal spine to in front of the anus; the blue streak from the snout, along the upper margin of the eye, to the base of the dorsal is absent. In other respects similar to var. γ .

GLYPHIDODON UNIOCELLATUS, (Q. & G.) Gthr. [No. 15112].

Glyphisodon uniocellatus, QUOY & GAIMARD, Voy. Uran. Zööl., 1824, 393, pl. 64, f. 4.—

CUV. & VAL., Hist. Nat. des Poiss., v, 1830, 481.

Glyphidodon uniocellatus, GÜNTHER, Cat. Fish., iv, 1862, 52.

Glyphidodon assimilis, GÜNTHER, op. cit., iv, 1862, p. 52.

D. $\frac{13}{12}$. A. $\frac{3}{13}$. L. lat. 28. L. trans. $\frac{2}{9}$.

Height of the body is contained $2\frac{1}{2}$ times in the total length (without caudal). Diameter of the eye greater than the width of the inter-orbital space, or than the length of the snout. The greatest width of the præorbital equals one-half the diameter of the eye. Teeth very narrow. Caudal fin subtruncated; lobes rounded. Beautiful azure-blue (in spirits), with round yellow spots scattered over the sides of the body; fewer than one to every scale; a dark band along the middle

of the nape of the neck and of the forehead; another from the commencement of the lateral line, through the eye, to the snout, where it meets its fellow of the opposite side; the lower side of the head brownish; a round black spot on the base of the soft dorsal, extending from the sixth to the eleventh ray.

Length, 1.50 inches.

GLYPHIDODON BONANG, (*Blkr.*) *Gthr.* [No. 15114].

Glyphisodon bonang, BLEEKER, Nat. Tyds. Ned. Ind., 1852, Sumatra, i, 582.

Glyphidodon bonang, GÜNTHER, Cat. Fish., iv, 1862, 45.

D. $\frac{12}{15-16}$. A. $\frac{2}{13}$. L. lat. 29.

Immature.—Height of the body is contained nearly twice in the total length (without caudal). Infraorbitals scaly. Uniform brown, with some scattered bluish spots; a black spot, blue-edged in smaller specimens, on the posterior dorsal rays.

LABRIDÆ.

JULIS SCHWANEFELDI, *Blkr.* [No. 15133].

Julis schwaneveldi, BLEEKER, Nat. Tyds. Ned. Ind., iv, 1853, Sumatra, ii, 288; Atl. Ichth., i, 1862, 95, pl. 33, f. 7.—GÜNTHER, Cat. Fish., iv, 1862, 191.

Body with six brownish cross-bands; two reddish streaks from behind the eye to the margin of the operculum, and one in front of the eye to the snout. Two deep blue spots on the dorsal fin, one on the spinous dorsal between the first and the third spines; the other on the soft portion between the first and the third rays; four or five spots of like character below the soft dorsal, on the posterior cross-bands of the sides.

STETHOJULIS ALBOVITTATA, (*Lacép.*) *Gthr.* [No. 15139].

Labrus alborittatus, LACÉP., Hist. des Poiss., iii, 1803, 443, 509.

Julis balticus, QUOY & GAIMARD, Voy. Uran. Zool., 1824, 267, pl. 56, f. 1.—Cuv. & VAL., Hist. Nat. des Poiss., xiii, 1829, 475.—BLEEKER, Nat. Tyds. Ned. Ind. ii, 1851, Banda, i, 253.

Stethojulis alborittata, GÜNTHER, Ann. & Mag. Nat. Hist., 1861, viii, 386; Cat. Fish., iv, 1862, 141.—BLEEKER, Atl. Ichth., i, 1862, 132, pl. 44, f. 5.

Four narrow, longitudinal bluish or whitish bands on the body; the upper commences at the upper margin of the orbit, and runs along the base of the dorsal fin; the second proceeds from the upper surface of the snout, through the eye, and terminates under the anterior part of the

lateral line; the third from the side of the snout, below the eye, through the angle of the operculum, to the middle of the base of the caudal fin; the fourth begins on the under part of the lower jaw, crosses the cheek in a curve to the sub-operculum, ascends along the gill-opening to the base of the pectoral fin, where it is interrupted; commences again in the axil of pectoral, and terminates on the lower part of the base of the caudal; it is curved on the body.

ACANTHURIDÆ.

ACANTHURUS LINEATUS, (Gm.) Bl. Schn. [No. 15131].

Chatodon lineatus, GMÉLIN, Syst. Nat., i, 1788, 1246.

Acanthurus lineatus, BLOCH, Syst. Ichth., ed. SCHN., 1801, 214, pl. 49.—CUV. & VAL., Hist. Nat. des Poiss., x, 1835, 223.—GÜNTHER, Cat. Fish., iii, 1861, 333; Jour. Mus. Godefr., ii, 1875, Fische der Sudsee, i, 111, pl. 70.

Acanthurus vittatus, BENNETT, Fish of Ceylon, 1837, pl. 2.

CHILODIPTERIDÆ.

APOGON AURITUS, C. & V.* [No. 15134].

Densely sprinkled with brown; a black, white-edged spot on the operculum.

APOGON FASCIATUS, (White) Q. & G. [No. 15108].

Mullus fasciatus, WHITE, Jour. Voy. New South Wales, 1790, 268, pl. 1.

Apogon novemfasciatus, CUV. & VAL., Hist. Nat. des Poiss., ii, 1829, 154.

Apogon fasciatus, QUOY & GAIMARD, Voy. Freyc. Zool., 1824, 344.—GÜNTHER, Cat. Fish., i, 1859, 241; Jour. Mus. Godefr., ii, 1873, Fische der Sudsee, i, 19, pl. 20, f. A, B.

Apogon aronbiensis, Homb. & Jacquin., Voy. au Pôle Sud, Poiss., 1853, 31, pl. 1, f. 1.

D. $7\frac{1}{9}$. A. $\frac{2}{3}$. L. lat. 25. L. trans. 8.

Ground color silvery, with four longitudinal dark brown bands along the sides of the body; the first short, along the back; the second, third, and fourth from the snout to the caudal; the second and fourth converging on the caudal. Spinous dorsal blackish; a black band across the base of the second dorsal and anal.

* See synonymy under Hawaiian Fishes.

APOGON GRÆFFI, *Günther* [No. 15110].

Apogon græffi, GÜNTHER, Jour. Mus. Godefr., ii, 1873, Fische der Sudsee, i, 22, pl. 20, f. E.

D. $6\frac{1}{2}$. A. $\frac{2}{3}$. L. lat. 24. L. trans. 8.

Greatest height of the body slightly more than one-third of the total length, and is contained $2\frac{1}{2}$ times in the same without the caudal. Diameter of the eye twice the length of the snout, and two-fifths of the length of the head. None of the bones of the head serrated. The end of the upper maxilla reaches nearly to the vertical from the center of the eye. The middle spines of the first dorsal prolonged, thread-like; the first very long, reaching, when laid back, to the summit of the second dorsal; second dorsal lower than the body. Silvery on the side of the head and breast; head dotted; the dots under a lens are seen to be stellate; a row of minute dots along the dorsal line of the body. The dorsal fins minutely punctate; the first darker than the second.

Length, two inches.

[No. 19249.] Another specimen of the same species in which the second dorsal spine is less prolonged, and the back and sides are covered with stellate spots; a brown spot on each side of the base of the caudal fin. In other respects similar to the above.

BERYCIDÆ.

HOLOCENTRUM DIADEMA, *Lacép.* [Nos. 15109, 15132].

Holocentrum diadema, LACÉP., Hist. des Poiss., iv, 1803, 372, 374; iii, 1803, pl. 32, f. 3.—RUPPELL, Atl. Fisches, 1828, 84, pl. 22, f. 2.—CUV. & VAL., Hist. Nat. des Poiss., iii, 1829, 213.—LESSON, Voy. Coq. Zoöl., 1830, ii, 220, pl. 25, f. 2.—GÜNTHER, Cat. Fish., i, 1859, 42; Jour. Mus. Godefr., ii, 1874, Fische der Sudsee, i, 97.

Perca pulchella, BENNETT, Zoöl. Jour., iii, 377, pl. 9, f. 3.

Red, with nine longitudinal silvery bands along the side; spinous dorsal blackish, with a white, curved band along the middle, here and there interrupted; the upper edge of the membrane between the spines white; the space between the second spine and first ray of the anal fin clouded.

MUGILIDÆ.

AGONOSTOMA DORSALIS, n. sp. [No. 15111]

D. $4\frac{1}{3}$. A. $\frac{3}{5}$.

The height of the body is one-fifth of the total length, and the length of the head is contained four and a half times in the same. Small teeth in the upper jaw; no teeth in the lower jaw, on the vomer, or palatines. Eyes without adipose membrane. Upper lip thin. The end of the maxilla extends to the vertical from the front margin of the orbit. Interorbital space flat. Præorbital serrated anteriorly and below. The anterior dorsal commences midway between the end of the snout and the base of the caudal fin.

Silvery, with a metallic luster along the back; the base of the second dorsal fin black.

Length, 1.50 inches.

CRUSTACEA.

MAIIDÆ.

LIBININÆ.

LIBINIA SEMIZONALE, *Streets.* n. sp.

Carapace pyriform; regions distinctly marked; surface shining, uneven, and shortly pubescent in places; pubescence more marked anteriorly; spinous. The arrangement of the spines is as follows:— eight in the median line of the body, placed, four on the gastric region, one on the genital, two on the cardiac, and one on the intestinal; on the anterior portion of the gastric region are two other spines, arranged transversely, in a line with the first one of the longitudinal series; so that all the spines of this region form the letter T; on the hepatic region are two spines, placed one above the other; immediately beneath these, on the lateral line, is another (on the left side there were two); the spines on the hepatic region, with those on the lateral line and the transverse row on the gastric region, taken together form a semicircle across the anterior portion of the carapace; sub-hepatic spines two, the anterior of which is the larger; there is another under the lateral line posterior to a sulcus separating the hepatic and branchial regions; four on the middle of the branchial region, inclosing a regular diamond-shaped space; another small spine on the upper part of the same region, on the edge of the depression separating it from the cardiac region; finally, there is an elevation, or a faint trace of a spine, on the posterior part of the branchial region.

Rostrum prominent, broad; broadest at the base, and slightly converging to the points; directed upward at an angle with the body; convex above and densely pubescent; the entire under surface deeply excavated; its apex obliquely truncated above, producing, by reason of its hollow under surface, two points, the outer surfaces of which are

straight and nearly parallel, while the inner margins are sloping, and converge to the median line of the rostrum; along the inner edge of the tips is arranged a row of long, stiff hairs; sides of the rostrum slightly concave, and at the base of the upper surface is a broad, shallow depression, which narrows to the apex of the bifurcation. A prominent spine projects over the inner canthus of the eye; the outer angle of the orbit not produced; a deep sulcus on the superior border of the orbit, which is bridged over at the top by a small spine, which arises from the base of the prominent spine at the inner canthus; on the inferior border of the orbit is another fissure, from the bottom of which is a strong spine, springing from the base of the outer angle, and projecting inward and downward under the basal article of the external antenna.

External antennæ hidden under the rostrum; the basal article robust, longer than broad, forming a part of the inferior border of the orbit; the external angle produced in the form of a tooth; the remaining articles slender and cylindrical; a row of long stiff hairs along the entire inner side of the antennæ.

Legs slender, smooth, and shining like the carapace; the joints cylindrical, with the exception of the fourth, which is depressed, and marked by a longitudinal depression above and below; the tarsi are tapering, and armed with long corneous points; the anterior pair of feet only very slightly more robust than the following; the hands much compressed; fingers slender, white at the tips, with their cutting edges approximating along nearly their entire length.

Abdomen composed of seven segments; on the center of the first segment there is a rather prominent tubercle; the terminal segment is somewhat triangular, with a rounded apex.

The breadth of the carapace is exactly three-fourths of the length. Length, including the rostrum, 2.70 inches; breadth, 2.03; the anterior pair of legs a little longer than the body; the length of the second pair equals that of the first; the length of the hand and carpus of the first pair comprise one-half of their entire length.

Locality: Lower California.

The arrangement of the spines on the surface of the carapace, and the absence of the lateral row of spines are sufficient to distinguish this species from all others belonging to the genus.

CANCRIDÆ.

XANTHINÆ.

ATERGATIS LIMBATUS, (*Edw.*) Dana.

Atergatis limbatus, DANA, U. S. Expl. Exped. Crust., i, 157.—HELLER, Crust. Novara Exped., 8.

Xantho granulatus, RÜPPELL, Krabben des rothen Meeres, 24, pl. 5, f. 3.

Ægle granulatus, DE HAAN, Faun. Japon., 17.

Cancer limbatus, EDWARDS, Hist. Nat. des Crust., i, 377, pl. 16, f. 1.

Locality: Hawaiian Islands.

CHLORODINÆ.

ETISUS LEVIMANUS, *Randall*.

Etisus levimanus, RANDALL, Jour. Acad. Nat. Sci. Philadelphia, viii, 115.—DANA, U. S. Expl. Exped. Crust., i, 185, pl. 10, f. 1.

Locality: Hawaiian Islands.

CHLORODIUS UNGULATUS, *Edwards*.

Chlorodius unguatus, EDWARDS, Hist. Nat. des Crust., i—DANA, U. S. Expl. Exped. Crust., i, 205, pl. xi, f. 8.

Locality: Hawaiian Islands.

CHLORODIUS SANGUINEUS, *Edwards*.

Chlorodius sanguineus, EDWARDS, Hist. Nat. des Crust., i, 402—DANA, U. S. Expl. Exped. Crust., i, 207, pl. xi, f. 11.—HELLER, Crust., Novara Exped., 18.

Chlorodius exaratus, STIMPSON, Proc. Acad. Nat. Sci. Philadelphia, 1858, 34.—EDWARDS, Hist. Nat. des Crust., i, 402.—DANA, U. S. Expl. Exped. Crust., i, 208.

Chlorodius inequalis, AUDOUIN, Explic. des. pl. de Savigny.—SAVIGNY, Desc. de l'Egypte. Crust., pl. v, f. 7.

Chlorodius Edwardsii, HELLER, Sitzungsberichte der Wiener Akademie, Bd., xliii, 336.

Cancer (Xantho) lividus, DE HAAN, Faun. Japon., 48, pl. xiii, f. 6.

Cancer (Xantho) affinis, DE HAAN, l. c. 48, pl. xiii, f. 8.

Locality: Hawaiian Islands.

ERIPHIDÆ.

ERIPHINÆ.

TRAPEZIA MACULATA, (*M'Leay*) Dana.

Trapezia maculata DANA, U. S. Expl. Exped. Crust., i, 256, pl. xv, f. 4.—STIMPSON, Proc. Acad. Nat. Sci. Philadelphia, 1858, 37; Ann. Lyc. Nat. Hist. N. Y., vii, 219.

Trapezia maculatus, KRAUSS, Südaf. Crust., 36.

Trapezia guttata, RÜPPELL, Krabben des rothen Meeres, 27.—HELLER, Crust., Novara Exped., 25.

Trapezia tigrina, EYDOUX & SOULEYET, Voy. de la Bonita, pl. ii, f. 4.

Grapsillus maculatus, M'LEAY, Crust. of Smith's Illust. Zool. S. Africa, 67.

Locality: Hawaiian Islands.

PORTUNIDÆ.

LUPINÆ.

NEPTUNUS SANGUINOLENTUS, (*Herbst*) De Haan.

Neptunus sanguinolentus, DE HAAN, Faun. Japon. Crust., 38.—ALPH. M. EDWARDS, Arch. du Mus. d'Hist. Nat. de Paris, 1860, x, 319.—HELLER, Crust. Novara Exped., 26.

Lupa sanguinolenta, DESMAREST, Crust., 99.—M. EDW., Hist. Nat. des Crust., i, 451; et Cuv. Règn. Anim. pl. x, f. 1.—DANA, U. S. Expl. Exped. Crust., i, 271.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, 38.

Portunus sanguinolentus, FABR., Suppl. Entom. syst., 365.—LATR., Encyclop. Method, x, 190.

Cancer palagicus, FABR., Mant. Ins., i, 318.—LIN., Syst. Nat., ed. Gmelin.

Cancer sanguinolentus, HERBST, Krabben und Krebse, i, 161, pl. 8, f. 56, 57.

Locality: Hawaiian Islands.

THALAMITA ADMETE, (*Herbst*) Latr.

Thalamita admete, LATR., Règn. Anim. de Cuvier, 2 ed., iv, 33.—M. EDWARDS, Hist. Nat. des Crust., i, 459; et Règn. Anim. de Cuv. Atlas Crust., pl. ix, f. 2.—DANA, U. S. Expl. Exped. Crust., i, 281, pl. xvii, f. 5.—ALPH. M. EDWARDS, Arch. du Mus., 1860, x, 356.—HELLER, Crust. Novara Exped., 28.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, 39.

Portunus admete, LATR., Nouv. Dict. d'Hist. Nat., xxviii, 44.

Cancer admetus, HERBST, Krabben und Krebse, pl. 57, f. 1.

Locality: Hawaiian Islands.

THALAMITA INTEGRA, Dana.

Thalamita integra, DANA, U. S. Expl. Exped. Crust., i, 251, pl. xvii, f. 6.—ALPH. M. EDWARDS, Arch. du Mus., x. 356.—STIMPSON, Proc. Acad. Nat. Sci. Phila. 1858, 39.

Locality: Hawaiian Islands.

The resemblance between the two preceding species of *Thalamita* is very close, and at first sight they may be very readily confounded; yet their differences are well marked and constant. In collecting them, the two kinds were thrown together as belonging to the same species; but when their specific characters were once recognized, there was no difficulty in separating the one from the other. The *integra* is much more abundant in the harbor of Honolulu, than the *admete*. In a lot of twenty-seven, collected from that locality, there were twenty-two of the former and five of the latter.

The following are the chief points of difference between the two species. In *integra* there are two spines on the superior edge of the hand; one, sharp-pointed, is situated on the middle of the border, and its base is continuous with an abrupt ridge running to the base of the hand; the second spine, usually blunt and eroded in the adult, but sharp-pointed in the young, is placed on the extreme distal angle of the upper border, and is also continuous by its base with another abrupt ridge, which extends toward the middle of the hand, but which is interrupted at the base of the first spine. The position of this second spine is a point of great diagnostic importance. Exterior to the superior edge is another spine, more or less worn down, the base of which coalesces with a rounded ridge, running toward the base of the hand; in front of and a little superior to the last, at the angle, is a slight prominence; there is a fourth spine at the base of the hand near the carpal articulation. The surface of the hand is smooth.

In *admete* there are likewise two spines on the superior border of the hand; but their arrangement is somewhat different. The outer one is not placed on the extreme distal angle of the hand, but is posterior to it; and the ridge which extends to the base of the hand, from the spine on the middle of the border, is serrated. The other spines on the hands have exactly the same arrangement as in *integra*. The superior surface of the hand is sparsely and coarsely granular; the inferior border finely granular.

The carapace furnishes some additional characters. In *integra* the

front is not on a straight line throughout its entire length, in the majority of cases. The crest of the base of the outer antennæ is not denticulated. Dana states that the "median region is not crossed by any raised lines;" while his figure shows them. They were present in all the specimens examined by me, and in this respect the species does not differ from *admete*. Anterior to the line crossing the middle region, and on either side of the median line of the body are two slight prominences; posterior to the median line is another, "which reaches to the posterior tooth on either side." The antero-lateral margin is four-toothed as in *admete*; only occasionally do we find a fifth tooth developed. The carapace is more convex.

The manner in which the carapace of the *admete* differs from the above description is briefly, as follows: The lines on the surface of the carapace are more prominent; in place of the two prominences anterior to the line crossing the median region of the body are two short serrated lines; and there are, in addition to these two, others of the same character, anterior to the extremities of the median transverse line. The carapace is more compressed, and "the crest of the base of the outer antennæ is evenly and short denticulated."

THALAMITA PYRMNA, (*Herbst*) M. Edw.

Thalamita pyrmna, M. EDWARDS, Hist. Nat. des Crust., i, 461.—DE HAHN, Faun. Japon. Crust., 43, pl. xii, f. 2.—ALPH. M. EDWARDS, Arch. du Mus. d'Hist. Nat., 1860, x, 360.

Thalamita crassimana, DANA, U. S. Expl. Exped. Crust., i, 234, pl. xvii, f. 9.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, 39.

Portunus pyrmna, LATREILLE, Nouv. Dict. d'Hist. Nat., xxviii, 44.

Cancer pyrmna, HERBST, Krabben und Krebse, pl. lvii, f. 2.

Locality: Palmyra Island, North Pacific.

The crest of the base of the outer antennæ differs somewhat from the description of it given by Dana. This distinguished carcinologist states, that the crest is irregularly divided. On the left side the crest bears three teeth; two of which are sharp and prominent, and the third is quite small. The latter is situated at the base of the inner prominent tooth. On the right side there have been three prominent teeth, but their apices are broken off, and the crest has the appearance of being "irregularly divided," as is shown in Dana's figure. The anterior margin of the arm is armed with four spines; the fourth—counting them in the same precedence as in the two species of the genus discussed above—

at the outer angle, is short and sometimes broken off. In every other respect the specimens examined are identical with the description and figure given by Dana. The fourth tooth on the antero-lateral margin is smaller than the rest, but the difference is not so great as is pictured in the figure.

ACHELOUS GRANULATUS, (*M. Edw.*) *Alph. M. Edwards*.

Achelous granulatus, ALPH. M. EDWARDS, Arch. du Mus. d'Hist. Nat. de Paris, 1860, x, 344.

Amphitrite speciosa, DANA, U. S. Expl. Exped. Crust., i, 276, pl. xvii, f. 1.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, 39.

Amphitrite gladiator, DE HAÄN, Faun. Japon. Crust., 65, pl. xviii, f. 1 (et non pl. 1).

Lupa granulata, M. EDWARDS, Hist. Nat. des Crust., i, 454.

Locality: Fanning Group of Islands, North Pacific.

CARCINUS MCENAS, (*Linn.*) *Leach*.

Carcinus mænas, LEACH, Melac. Podophth. Brit., pl. v; Edinb. Encyclop., vii, 429; Trans. Linn. Soc., xi, 314; Encyclop. Britann. Suppl., i, 410.—AUDOUIN, dans l'ouvrage de Savigny, Egypte. Crust., pl. iv, f. 6.—M. EDWARDS, Hist. Nat. des Crust., i, 434.—GOULD, Report on the Invertebrata of Massachusetts, 321.—DE KAY, Nat. Hist. N. Y., Crust., 8, pl. v, f. 5-6.—BELL, British. Crust., 76.—ALPH. M. EDWARDS, Arch. du Mus. d'Hist. Nat. de Paris, 1860, x, 391.—HELLER, Crust. Novara Exped., 30.

Carcinus granulatus, SMITH, Report of Commissioner of Fish and Fisheries, 312, 547.

Portunus mænas, LEACH, Edinb. Encyclop., vii, 390.—COSTA, Fauna del regno di Napoli, Crust. g. Portuno., 7.

Cancer granulatus, SAY, Jour. Acad. Nat. Sci. Phila., 1817, i, 61.

Cancer mænas, LINN., Syst. Nat., xii, i, 1043.—PENNANT, Brit. Zool., iv, 3, pl. iii, f. 3.—BASTER, op. subst. ii, 19, pl. ii.—HERBST, Krabben und Krebse, pl. vii, f. 46.—FABRICIUS, Entom. Syst. Suppl., 11, 450; 41, 334, 3.—LATREILLE, Gen. Crust. et Insect., 1, 30, 2.

Locality: Hawaiian Islands.

This is the first well-authenticated instance, to my knowledge, where the genus *Carcinus* is recorded as coming from the Pacific regions. In the museum of the Academy of Natural Sciences of Philadelphia, there is a specimen labeled from Australia, with an interrogation mark. It is probable that all the specimens obtained from this region have only been stragglers from the Atlantic. The Hawaiian Islands, where the last came from, have been thoroughly ransacked by collectors for this kind of life; and, had the species been common, it could not have well eluded the search so long. That it is a wandering crab, almost cosmopolitan in

its range, is seen by glancing at the extent of country that is embraced in its wanderings. It is common on the coasts of France and England; it is found in the Baltic Sea, along the shores of the Mediterranean, and in the Red Sea. It is by no means an uncommon crab along the whole extent of the eastern coast of the United States, and Heller records it as coming from the shores of Brazil.

I am able to detect some differences, amounting probably to a slight geographical variation, among the specimens coming from these widely separated localities. Those from the American coast differ from the European in having a slight increase in the convexity of the carapace, with coarser granulations over its surface. The teeth of the front are also much more prominent. In the European specimens the projections of the front hardly amount to more than undulations; while in those from this side they are teeth-like. An increased development in the same direction is observed in the individual from the Hawaiian Islands. If what I have stated here should hold good through a large series of specimens, it will be an interesting instance of progressive development from east to west, where the difference in the local conditions are less pronounced than from north to south in corresponding degrees of longitude.

ASSECLA, *nov. gen.*

Carapace convex, broader than long, smooth and shining; front broad, produced, broadly triangular; antero-lateral and postero-lateral borders nearly equal in length; the latter converging posteriorly; antero-lateral border five-lobed; hiatus at the internal angle of the orbit completely closed by a process from the base of the external antenna; the movable part of the antenna excluded from the hiatus; a process from the front descends to meet the process from the base of the external antenna. The third joint of the external maxillipeds longer than broad at the base; broader at the base than at the apex, irregularly quadrilateral; inner angle of the base somewhat projecting. A prominent ridge on the palate; the ridge is not produced to the anterior margin of the buccal area. Basal article of the external antennæ large, nearly longitudinal. Arm not projecting beyond the carapace; hand short, carinated; tarsus of the posterior pair of legs flattened, subovate, or lanceolate-ovate; very slightly modified into a swimming apparatus.

In respect to the development of its natatorial feet this genus bears the same relation to *Lissocarcinus*, as *Carcinus* does to *Platyonichus*.

ASSECLA HOLOTHURICOLA, *n. sp.*

Carapace broader than long, surface smooth and shining; the antero-lateral and postero-lateral borders very nearly of the same lengths; front broad, produced, broadly triangular, on a higher level than the antero-lateral border, and continuous with the superior margin of the orbit; anterior margin somewhat sinuous; the antero-lateral border thin, everted, five-lobed; second lobe the broadest; the free margins of the lobes straight; the angles slightly rounded; the divisions separated only by fine incisions; the gastric region of the carapace elevated; the antero-lateral parts much excavated. The lateral projection at the junction of the antero- and postero-lateral borders more tooth-like than lobular, and more projecting than the other lobes, thick and obtuse; a high, prominent ridge running from its apex, at first, inward and slightly backward, and then inward and forward on the swollen portion of the carapace, terminating abruptly at the junction of the middle with the lateral third of the breadth of the carapace; a flattened, scarcely prominent ridge anterior to and parallel with the preceding, terminating at the bottom of the lateral sulcus. The prominent edge of the postero-lateral border converging posteriorly. The post-orbital angle of the first lobe not rounded, rectangular; a fissure on the superior margin of the orbit near the external angle; the inferior margin entire, finely granular; a fissure at the outer angle; the inner angle projecting as a prominent tooth. Areolations on the surface of the carapace indistinct; a shallow depression extending to the apex of the front, and on either side of this is a broad prominence (2 F and 1 M consolidated); 2 M and 3 M consolidated; 1 P slightly prominent. Central line of the body high and convex, sloping toward the sides, which are concave. The first and second joints of the external antennæ cylindrical; the apex of the second joint on a level with the frontal margin.

The third joint of the outer maxillipeds longer than broad; inner margin oblique; superior margin straight; angles prominent; irregularly rectangular in outline, broader at the base than at the top. Inferior regions finely pubescent; the pubescence only seen under the lens.

Hand strongly bicarinated on the superior surface; a well-marked ridge on the middle of the external surface; above the preceding is a flattened, nearly obsolete ridge; the inferior surface smooth; a high crest along the whole length of the upper edge of the movable finger; at the base of the crest, on either side, is a sulcus, extending the entire length of the finger; the inner and outer surfaces of both fingers deeply

grooved; thumb slightly deflexed on the palm; apices of fingers pointed, beaked, and overriding when closed; cutting-edges strongly toothed; five prominent, conical teeth on each edge; sometimes two smaller ones between second and third, and third and fourth; carpus carinated above; two ridges on the external surface; an obtuse spine projecting from the anterior part of the inner surface; the ridges on the carpus sinuous; arm smooth, and not projecting beyond the lateral border of the carapace.

The posterior legs compressed; contracted at the articulation of the third and fourth articles; the fifth article and all the tarsi, except those of the last pair of legs, furrowed on their anterior and posterior surfaces; on the anterior surface of the tarsi the two furrows, the one above and the other below, separated by a prominent ridge, become continuous at the proximal extremity around the base of the ridge; the fifth joint and tarsus of the last pair compressed to a greater degree than the corresponding joints of the preceding legs; tarsus very much flattened, not grooved, oblong-ovate; apex corneous, hooked; a few short and fine hairs on the lower border of the tarsi; at the base of the tarsus of the last pair, and at the distal extremity of the fifth joint below, is a tuft of hairs.

Abdomen of female broadly ovate, and composed of seven pieces.

Color: The whole upper surface of the carapace purple, with the following exceptions: a narrow line of white around the entire free margin of the carapace, following the incisions between the lobes on the antero-lateral border; a round spot of the same color at the anterior superior angle of the orbit, and a short oblong spot, commencing at the apex of the front, extending its whole length; a round spot on the apex of the projecting lateral tooth, and another, similar, on the carapace just anterior to the termination of the lateral ridge. The arrangement of the colors on the legs is somewhat peculiar. Ground color purple; the distal extremities of the third and fifth joints, and the proximal end of the fourth, white. The purple color extends over the whole hand, except at the base of the movable finger, and on the palm opposite the articulation of the finger; the carinae white; a ring of purple around the carpus; the proximal extremity white, and a spot of the same color on the distal end above; the upper surface of the arm purple.

Length, 0.45 inch; breadth, 0.56 inch; ratio of length to breadth, 1: 1.2

Locality: Palmyra Island, North Pacific. Taken from the cloacal dilatation of the alimentary tract of a *holothurian*. This is the first in-

stance on record where a crustacean of the family *Portunidae* has been found living as a "free messmate" in another animal. Others possessing this habit have belonged, without exception, to families much lower in the scale of classification. The elaborate system of coloration, and the asperities on the surface of the carapace of this crab, would incline us to believe that this is not its permanent place of residence. The *Pinnotheridae* are devoid of color-markings, and their shell is more or less rounded, the irregularities of the surface being removed by the constant pressure to which it is subjected by the living walls of their dark abode.

Belonging to this new genus, and closely allied to the above, is *Lissocarcinus orbicularis*, Dana. The arrangement of the colors on the legs is almost identical in the two species; the general shape of the front is similar, and there is the same smooth and shining surface. The *holothuricola*, however, is readily distinguished by its being less orbicular, and more produced transversely, and by the prominent posterior tooth of the antero-lateral border. The third joint of the outer maxillipeds is straight, and almost quadrangular; in *orbiculare* its shape is more irregular. In the latter the antero-lateral margin is a "little reflexed," while in the former it is everted. The shape of the claws and ambulatory feet is the same in both species.

PODOPHTHALMUS VIGIL, (*Fabr.*) *Leach*.

Podophthalmus vigil, LEACH, Zool. Miscell., ii, pl. cxviii.—GUERIN, Icon. du Règne Anim. Crust., pl. i, f. 3.—M. EDWARDS, Hist. Nat. des Crust., i, 467; Règne Anim. de Cuvier, Crust., Atlas, pl. ix, f. 1.—DE HAAN, Faun. Japon., Crust., 44.—ALPH. M. EDWARDS, Arch. du Mus. d'Hist. Nat. de Paris, 1860, x, 420.

Podophthalmus spinosus, LAMARCK, Syst. des Anim. sans vertèb., 152; Hist. des Anim. sans vert., v, 157.—LATREILLE, Gen. Crust. et Insect., i, pl. i et ii, f. 1; Hist. Nat. des Crust. et des Insect., vi, 54, pl. xlv; Règne Anim. de Cuvier, iv, 33; Encyclop. Meth., x, 166.—DESMAREST, Considerat. sur les Crust., 100, pl. vi, f. 1.

Portunus vigil, FABRICIUS, Suppl. Entom. Syst., 363, no. 1.

Locality: Fanning Group of Islands, North Pacific.

MACROPHTHALMIDÆ.

OCYPODINÆ.

GELASIMUS GIBBOSUS, *Smith*.

Gelasimus gibbosus, SMITH, Trans. Connecticut Acad., vol. ii, 140, pl. ii, f. 1, et pl. iv, f. 8;

Report of the Peabody Academy of Sciences, 1869, 91.

Locality: La Paz, Lower California.

Bull. N. M. No. 7—8

OCYPODA CERATOPHTHALMA, (*Pallas*) *Fabr.*

Ocypoda ceratophthalma, FABR., Suppl. Entom. Syst., 347.—LATR., Hist. Nat. des Crust., vi, 47; Encyclop. Meth., pl. 274, f. 1.—DESMAREST, Consid. sur les Crust., 121, pl. 12, f. 1.—DE HAAN, Faun. Japon., Crust., 29.—M. EDWARDS, Hist. Nat. des Crust., ii, 48; Atlas du Règne Anim. de Cuvier, Crust., pl. 17, f. 1; Mélanges Carcinologiques, 105.—KRAUSS, Südafrik. Crust., 41.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, x, 100.

Ocypoda brevicornis, M. EDWARDS, Hist. Nat. des Crust., ii, 48; Mélanges Carcinologiques, 106.—DANA, U. S. Expl. Exped., Crust., i, 326, pl. xx, f. 3.

Cancer ceratophthalmus, PALLAS, Spicil. Zoöl. fasc., 83, pl. 5, f. 17.

Locality: Fanning Group, North Pacific.

GECARCINIDÆ.

UCAINÆ.

CARDISOMA OBESUM, *Dana*.

Cardisoma obesum, DANA, Proc. Acad. Nat. Sci. Phila., 1851, v, 252; U. S. Expl. Exped. Crust., i, 375, pl. xxiv, f. 1.—M. EDWARDS, Mélanges Carcinologiques, 171.—

STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, x, 100.

Cardisoma urvillei, M. EDWARDS, Mélanges Carcinologiques, 170.

Locality: Fanning Group. A lateral edge to the carapace is more apparent in the young and in females, than in the adult males. In the former there is a small point, or projection, behind the post-orbital angle. In the females the hands are shorter, the fingers are less attenuated, and their cutting-edges are more closely approximated, and evenly denticulated than in the males.

GRAPSIDÆ.

GRAPSINÆ.

METOPOGRAPSUS THUKUHAR, (*Owen*) *M. Eduw.*

Metopograpsus thukuhar, M. EDWARDS, Annal. des Sci. Nat., 3re Sér. xx, 165; Mélanges Carcinologiques, 131.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, x, 101.

HELLER, Crust. Novara Exped., 43.

Goniograpsus thukuhar, DANA, U. S. Expl. Exped. Crust., i, 344.

Pachygrapsus parallelus, RANDALL, Jour. Acad. Nat. Sci. Phila., viii, 124.

Grapsus thukuhar, OWEN, Crust. Beechey's Voyage, Blossom, 80, pl. xxiv, f. 3.

Locality: Hawaiian Islands.

PACHYGRAPSUS CRASSIPES, *Randall*.

Pachygrapsus crassipes, RANDALL, Jour. Acad. Nat. Sci. Phila., viii, 127.—M. EDWARDS, Melanges Carcinologiques, 132.—STIMPSON, Jour. Boston Sci. Nat. Hist., 1857, vi, 27; Proc. Acad. Nat. Sci. Phila., 1858, x, 102.

Locality : Lower California.

GRAPSUS RUDIS, *M. Edw.*

Grapsus rudis, M. EDWARDS, Hist. Nat. des Crust., ii, 87; Annal. des Sci. Nat., 3 re Ser. xx, 168; Melanges Carcinologiques, 134.—GIBBES, Amer. Assoc. Advan. Science, 1850, 17.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, x, 102.—HELLER, Crust. Novara Exped., 47.

Grapsus hirtus, RANDALL, Jour. Acad. Nat. Sci. Phila., viii, 124.

Locality : Fanning Group.

GEOGRAPSUS CRINIPES, (*Dana*) *Stimp.*

Geograpsus crinipes, STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, x, 101.—HELLER, Crust. Novara Exped., 48.

Grapsus crinipes, DANA, Proc. Acad. Nat. Sci. Phila., 1851, v, 249; U. S. Expl. Exped., Crust., i, 341, pl. xxi, f. 6.—M. EDWARD, Melanges Carcinologiques, 136.

Locality : Fanning Group. There is less concavity in the posterior border of the epistome in this specimen than is given in Dana's figure. This authority lays particular stress upon this point, but I deem it of minor importance. The specimen agrees in every other particular.

PINNOTHERIDÆ.

PINNIXIA TUMIDA, *Stimp.*

Pinnixia tumida, STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, x, 108.

Locality : Bellañas Bay, Lower California. Removed from the interior of the body of a *holothurian*.

Although separated by the entire width of the Pacific Ocean, yet this specimen agrees in every particular with the description given by Stimpson of a species from the port of Hakodadi, on the island of Jesso. *P. tumida* and *P. faba*, Dana, are the only species of this genus that are characterized by the absence of ridges on the superior surface of the carapace. There is nothing in Dana's description of his species, which came from Puget Sound, which would militate against this being the same; but in the plate a figure of the hand is given, in which the fingers are oblique, as in *tumida*, but there is no hiatus between them, and the

tooth on the middle of the movable finger is wanting, both of which points are very characteristic of *tumida*.

The other species of crustacea which are common to both the Asiatic and American shores of the Pacific are *Trapezia maculata*, *Liomera lata*, *Liomera cinctimana* and *Pachygrapsus crassipes*. The latter, a subterranean crab, was obtained by Stimpson from the port of Simoda, Japan. The first three are littoral in their habits, and are Indo-Pacific species. On the American side all of these species have come, so far, from the Lower Californian coast only.

CALAPPIDÆ.

CALAPPA TUBERCULATA, *Fabr.*

Calappa tuberculata, FABRICIUS, Suppl. Entom. Syst., 345.—HERBST, Krabben und Krebse, 204, pl. 13, f. 78.—GUÉRIN, Iconog. Crust., pl. 12, f. 2.—M. EDWARDS, Hist. Nat. des Crust., ii, 106.—DANA, U. S. Expl. Exped. Crust., i, 393.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, x, 162.—HELLER, Crust. Novara Exped., 69.
Calappa hepatica, DE HAAN, Faun. Japon. Crust., 70.

Locality: Hawaiian Islands.

HIPPIDÆ.

BLEPHAROPODA OCCIDENTALIS, *Randall.*

Blepharopoda occidentalis, RANDALL, Jour. Acad. Nat. Sci. Phila., viii, 131, pl. vi.—GIBBES, Proc. Amer. Assoc. Advan. Sci., 1850, 187.—STIMPSON, Jour. Boston Soc. Nat. Hist., vi, 46; Proc. Acad. Nat. Sci. Phila., 1858, x, 230.
Albunhippa occidentalis, DANA, U. S. Expl. Exped. Crust., i, 405, 406.

Locality: Lower California.

PAGURIDÆ.

CALCINUS TIBICEN, (*Herbst*) *Dana.*

Calcinus tibicen, DANA, U. S. Expl. Exped. Crust., i, 457.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, x, 234.—HELLER, Crust. Novara Exped., 87.
Pagurus levimanus, RANDALL, Jour. Acad. Nat. Sci. Phil., viii, 135.
Pagurus tibicen, M. EDWARDS, Hist. Nat. des Crust., ii, 229; Atlas du Règne Anim. de Cuv., Crust., pl. 44, f. 3.
Cancer tibicen, HERBST, Krabben und Krebse, pl. 23, f. 7.

Locality: Hawaiian Islands.

CALCINUS LATENS, (*Randall*) *Dana*.

Calcinus latens, DANA, U. S. Expl. Exped. Crust., i, 459, pl. 28, f. 11.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, x, 234.—HELLER, Crust. Novara Exped., 88.
Pagurus latens, RANDALL, Jour. Acad. Nat. Sci. Phila., viii, 135.

Locality: Hawaiian Islands.

In alcoholic specimens the color of the carpus and anterior surface of the arm is red, with white spots. Some of the spots on the superior surface of the carpus are slightly elevated. In few of the specimens the red color of the carpus is very faint. The basal portion of the tarsi of the posterior legs, in some cases, is brownish-red, and in others purplish.

CLIBANARIUS ZEBRA, *Dana*.

Clibanarius zebra, DANA, U. S. Expl. Exped. Crust., i, 465, pl. 29, f. 5.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, x, 235.

Locality: Hawaiian Islands.

CENOBITIDÆ.

CENOBITA OLIVIERI, *Owen*.

Cenobita olivieri, OWEN, Crust. Beechey's Voy. Blossom, 84.—DANA, U. S. Expl. Exped., Crust., i, 470.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, x, 232.—HELLER, Crust. Novara Exped., 82.
Pagurus clypeatus, OLIVIER, Encyclop. Méth. Ins., viii, 643, pl. 311, f. 1.

Locality: Fanning Group.

We found this crab to be most abundant on Palmyra Island. They climbed the trees and bushes, dragging after them the heavy shell of the *Turbo argyrostoma*, which they use to the exclusion of all other shells. It is probable that they climb the trees for the purpose of feeding on the mosses and lichens that grow thereon.

CENOBITA PANAMENSIS, *Streets*.

Cenobita panamensis, STREETS, Proc. Acad. Nat. Sci. Phila., 1871, xxiii, 241.
Cenobita intermedia, STREETS, Proc. Acad. Nat. Sci. Phila., 1871, xxiii, 241.

Locality: Lower California.

When describing the type of this species in 1871, I stated that the tarsus of the third leg of the left side was shorter than the corresponding leg of the right side. As this difference is not observable in the present specimen, which agrees with *panamensis* in every other respect, it was doubtless nothing more than an individual variation. The tarsus of the third leg, left side, is slightly longer than that of the right side,

which is the case in *C. intermedia*. The failure of the principal point of difference between the species necessitates their union under one name. I therefore retain *panamensis*, and reduce *intermedia* to the status of a synonym.

The color is better defined in the recent specimen. The external surface of the larger hand is brown, except at the superior margin and at the posterior inferior angle; the upper half of the external surface of the carpus, both sides, of the same color as the hand; the lower half uncolored, or slightly stained with orange; a large spot of orange on the anterior, truncated surface of the arm. The fourth article of the posterior legs is marked in the same manner as the carpus, with the addition of a deep line of purple at the lower edge of the brown, which extends from the center of the article to its articulation with the third article; a brownish, or purplish, spot at the base of the fifth article. This spot is wanting on the last leg of the left side. The third joint of the last pair is purplish; the tarsi brownish-orange. The carapace anteriorly purplish; two patches of the same color posteriorly on each side. The peduncles of the eye a deep buff.

Total length of the carapace 1.00 inch.

BIRGUS LATRO, *Leach*.

Birgus latro, LEACH, Trans. Linn. Soc., xii—M. EDWARDS, Hist. Nat. des Crust., ii, 246; Atlas du Règne Anim. de Cuv., pl. 43, f. 1.—QUOY & GAIMARD, Voy. de l'Uranie, pl. 80.—DANA, U. S. Expl. Exped. Crust., i, 474, pl. 30, f. 5.—STIMPSON, Proc. Acad. Nat. Sci. Phila., 1858, x, 232.—DARWIN, Naturalist's Voyage Around the World, 462.

Cancer latro, HERBST, Krabben und Krebse, ii, 34, pl. 24.

Cancer crenulatus, RUMPHIUS, Mus., pl. 4.—SEBA, iii, pl. 21, figs. 1 et 2.

Locality: Washington, or New York Island, Fanning Group. Common. Confined to this one island of the group. At one time this giant land-crab was supposed to be restricted to a single group of islands in the Pacific, south of the equator; in recent times, however, its habitat has been widely extended, so that there is hardly a group, either north or south of the equator, where it is not found. They live in holes in the ground; and they line the bottoms of their burrows with the fine fibers of the cocoanut-husk. The unwary native, in seeking to rob the crab of its soft bed, occasionally finds his fingers imprisoned in its vise-like grip. It is interesting to know that in such an emergency a gentle titillation of the under soft parts of the body will cause it to immediately loose its hold. So tenacious is their grasp that I have seen them

hang suspended from a tree for more than an hour, holding on to a stick which had been thrust between their claws. The wonderful stories about these crabs climbing the trees after cocoanuts are purely fictitious. They eat the nuts after they have fallen to the ground, first stripping off the husk, and then breaking through the shell at the end containing the eyes.

CRANGONIDÆ.

CRANGON FRANCISCORUM, *Stimp.*

Crangon franciscorum, STIMPSON, Proc. California Acad. Nat. Sci., 1856, i, 89; Jour. Boston Soc. Nat. Hist., 1857, vi, 495, pl. 22, f. 5; Crust. and Echin. Pacific coast of N. Amer., 55.

Locality: San Francisco Bay, California.

PALÆMONIDÆ.

HIPPOLYTE GIBBOSUS, *M. Edw.*

Hippolyte gibbosus, M. EDWARDS, Hist. Nat. des Crust., ii, 378.—DANA, U. S. Expl. Exped. Crust., i, 565, pl. 36, f. 4.—HELLER, Crust. Novara Exped., 120.

Locality: Hawaiian Islands.

There are seven teeth along the under margin of the rostrum, instead of six, which is the number given by Dana.

PALÆMON ACUTIROSTRIS, *Dana.*

Palæmon acutirostris, DANA, U. S. Expl. Exped. Crust., i, 590, pl. 39, f. 1.

Locality: Hawaiian Island.

SERGESTIDÆ.

SERGESTES MACROPHthalmus, *Stimp.*

Sergestes macrophthalmus, STIMPSON, Proc. Acad. Nat. Sci. Phila., 1860, xii, 46.

Locality: North Pacific Ocean.

There is no doubt about the identity of this species. It is very easily identified by the arrangement of the spines on the cephalothorax and abdomen. In addition to the supra-orbital and hepatic spines, there is one on the middle of the dorsal surface of the carapace, at its posterior extremity; this spine is small and erect. There is an oblique spine on the posterior dorsal extremity of the fourth, and of the fifth abdominal segments; that on the fourth is the larger. No other species of this genus presents this peculiar arrangement of dorsal spines. But Stimp-

son makes no mention of spines on the other segments of the abdomen. They were evidently broken off in his specimen, as they are on some of the segments of the present specimen, which, however, shows a greater number than he states to be present. No evidence of spines were seen on the first and second segments; but at the posterior extremity of the dorsal surface of the third is an erect spine, similar to the one on the posterior extremity of the carapace. The sixth segment has an oblique spine at its extremity, which is smaller than those on the two preceding segments. An un mutilated specimen will doubtless show the first and second segments to be armed with erect spines similar to that on the third, and on the extremity of the carapace.

SERGIA, *Stimp.*

Sergia, STIMPSON, Proc. Acad. Nat. Sci. Phila., 1860, xii, 46.

In certain of its characters *Sergia* recalls *Lucifer*; while in others it is strongly related to *Sergestes*. Its own peculiar characters are in its fourth and fifth pairs of feet, which are long; and the dactylus is palmiform. Its body is elongated like *Lucifer*, but not so attenuated, and there is the same extension of the antennary segment anterior to the buccal region, which is carried to so great a degree in *Lucifer*. And again, as in the latter genus, there is a spheroidal auditory body imbedded in the base of the peduncle of the internal antennæ.

SERGIA REMIPES, *Stimp.*

Sergia remipes, STIMPSON, Proc. Acad. Nat. Sci. Phila., 1860, xii, 46.

Carapace very much elongated, depressed, subcylindrical; a lateral view shows nearly the same vertical diameter from the front to the extremity of the sixth abdominal segment; the cervical suture distinct; the length of the antennary segment anterior to this suture equals more than half the length of the carapace proper; no hepatic spine. Front slightly projecting and broadly rounded; the outer angles, over the eyes, rounded and projecting, shorter than the front. Eye subfuniform, short, its length less than one-third the length of the carapace; it extends very little beyond the apex of the basal article of the peduncle of the inner antennæ. Antennary scale broad, extending nearly midway the last joint of the antennary peduncle; inner margin and apex furnished with closely-set plumulose-cilia; a spine on the outer margin below the apex.

The second and third pairs of external maxillipeds pediform, elongate; the three terminal joints of the second pair thickened, bent backward; the third pair very long, exceeding the length of the thoracic feet, and extending anteriorly to about the apex of the inner antennary peduncle. The maxillipeds, and the six anterior thoracic feet, furnished with long, simple setæ. The fourth and fifth pairs of thoracic feet slenderer than the preceding, cylindrical, more sparsely furnished with setæ; setæ plumulose; dactylus flattened, subovate; fifth pair shorter than the fourth; fourth almost as long as the carapace. Abdominal feet long and narrow; first pair nearly as long as the carapace; the length of the peduncle almost equals the length of the rami; the length of the feet decreases posteriorly, while the diameter of the peduncle increases; the margins of the rami densely covered with long, plumulose cilia. Abdomen longer than the cephalothorax; the five anterior segments subequal; the sixth long, equals the lengths of the fourth and fifth combined; fifth unarmed above; the posterior margin of the sixth, above and below, acute; inferior border furnished with long, plumulose cilia. The external margin of the outer caudal lamella armed with an aculeate spine near the posterior extremity. The margins of all the caudal appendages, except the external margin of the outer lamella anterior to the spine, furnished with long, equidistant, feathery cilia.

A comparison of the above description with that given by Stimpson shows that they agree in every particular, except in the length of the eyes—which he distinctly states reaches to the apex of the penultimate article of the antennary peduncle—and in the character of the front. Concerning the latter, he says, “rostrum minutely spinous, acute, curved, dorsum armed with a tooth or spine.” Neither the spine nor the spiniform rostrum, are observable in the present specimen. The eyes were somewhat shrunken, and the front was probably mutilated in the surface tow-net in which the animal was caught. When the author states that the spines are minute, in a specimen only a half an inch long that requires a microscope to examine any part of its structure, they must be exceedingly small, and are very apt to be broken off by the rush of the water through the net. If these differences are found to be constant, this will constitute a distinct species; but I am not willing to found it upon the examination of a single specimen.

Locality: North Pacific Ocean.

Caught June 28, 1873, in latitude 30° north, longitude 145° west.

LUCIFERIDÆ.

LUCIFER ACESTRA, *Dana*.

Lucifer acestra, DANA, U. S. Expl. Exped. Crust., i, 671, pl. 44, f. 9.

Locality: North Pacific Ocean.

Male caught June 28, 1873, in latitude 30° north, longitude 146° west; female, May 9, 1873, in latitude 4° north, longitude 127° west.

After an examination of the genus *Sergia* there is no longer any doubt in my mind, that the place for *Lucifer* is with the lower Macroura rather than with the Schizopoda. The propriety of even elevating it to the dignity of a separate family is questionable.

I make the following addition to the characters already pointed out as distinguishing the sexes of this species. In the females the extremity of the internal margin of the outer caudal lamella projects beyond the apex of the spine at the extremity of the external margin; in the male this margin is not produced at all, but is truncated. The truncated surface is rounded, and slopes forward and inward from the base of the spine.

EUPHAUSIDÆ.

EUPHAUSIA GIBBOSA, n. sp.

Carapace short rostrate; rostrum broad, triangular, on a lower level than the superior surface of the carapace; the superior surface behind the rostrum gibbous, elevated slightly above the rest of the surface. Inner antennæ three-jointed, about three times as long as the eye; the first joint as long as the second and third together; its apex above produced into a long spine, which reaches half the length of the following joint, and directed upward and somewhat forward; the apex of second joint also produced, but spine shorter and directed more forward; second and third joints subequal; a tuft of long hairs at the apex of the last joint; the flagellum long, and with antenna about as long as the body. The antennary scale oblong, as long as the base of the antenna; the apex furnished with long, curved cilia; flagellum of the outer antenna about as long as that of the inner pair. The feet slender; the last three joints longer than the one next preceding; the penult and antepenult subequal; the ultimate a little more than half the length of the penult; the setæ long and plumulose; the palpus about one-third the length of the leg, those on the anterior legs longer. Branchiæ ramose. The

sixth abdominal segment as long as the two preceding; the caudal segment longer than the lamellæ; the two subapical barbs salient.

The tumid, hunched appearance of the anterior portion of the carapace, and the spines at the apices of the first and second basal joints of the inner antennæ, are characters which have not been mentioned in any previously-described species of this genus. They are very characteristic of this species, and will serve readily to distinguish it from all others.

Length, .45 of an inch.

Locality: North Pacific Ocean. Latitude 30° north; longitude 145° west. Caught June 28, 1873.

CYRTOPIA ROSTRATA, Dana.

Cyrtopia rostrata, DANA, U. S. Expl. Exped. Crust., i, 648, pl. 43, f. 2.

Locality: North Pacific Ocean. Latitude, 3° north; longitude, 128° west. Collected May 10, 1873.

Several specimens of this species were obtained, and they are all more rudimentary in form than that described by Dana. I failed to detect the slightest evidence of branchiæ. These organs were rudimentary in Dana's specimen; and in another genus—*Furcilia*, which is very closely allied, and more rudimentary still—they are entirely absent. In one instance the carapace was excavated behind, across the dorsum, as in the latter genus. All the specimens, but one, showed the apex of the first joint of the inner pair of antennæ prolonged at its outer and inner angle beyond the summit of the following joint, to about the same extent as it is carried in some species of *Furcilia*. The abdominal feet were rudimentary. The gibbous eyes, the long acute beak, and the anteriorly projecting tooth on the lateral border of the carapace were present in all. The facts cited above add greater weight to the testimony already adduced, that the place for Dana's provisional genus *Furcilia* is near *Cyrtopia*, in the family *Euphausiæ*.

MYSIDÆ.

MYSINÆ.

SIRIELLA GRACILIS, Dana.

Siriella gracilis, DANA, U. S. Expl. Exped. Crust., i, 658, pl. 44, f. 1.

Locality: North Pacific Ocean. Latitudes 20° and 30° north; longitudes 149° and 145° west. Collected May 19 and June 28, 1873.

In all the specimens collected, the abdominal appendages were well developed, with stout oblong bases, and with two subequal, multiarticulate, ciliate rami, somewhat longer than the base. There is also present an oblong scale at the apex of the basal portion of the first pair of antennæ. Both these characters are said by Dana to be wanting; and their presence assimilates the genus more closely with *Promysis* and *Macromysis*.

COROPHIIDÆ.

CLYDONINÆ.

CLYDONIA LONGIPES, Dana.

Clydonia longipes, DANA, U. S. Expl. Exped. Crust., ii, 835, pl. 55, f. 7.—SP. BATE, Cat. Amphi. Crust., 284, pl. xlvii, f. 9.

Locality: North Pacific Ocean. The exact locality was lost.

The specimen in our collection is un mutilated; and, consequently, shows those parts intact that Dana stated were wanting in his. Concerning the antennæ, he says: "Only two were observed, and these were long, straight, stout, rigid organs, lying side by side, and, excepting the basal joints, hardly articulated, or only indistinctly so." The presence of but two antennæ was not an anomalous condition, but an accidental one, owing to mutilation. Commenting on the above statement, Sp. Bate says: "The author does not state which pair of antennæ are absent. The superior pair are probably rudimentary." Our specimen shows two pairs of antennæ occupying their normal positions, and those described by Dana are not the inferior, but the superior pair.*

The inferior pair are longer, and more slender organs than the superior, and are folded upon themselves, and partly hidden under the body. They arise from the under and outer surface of the first segment of the cephalothorax, posterior and external to the superior pair. The first basal joint is short and stout, more than twice the breadth of the second, which is oblong in shape and longer than the first; the third article is cylindrical, half the breadth of the second and twice as long. At its articulation with the second basal joint, it is bent obliquely upward between the basal portion of the superior pair. The flagellum is very long, and attenuated toward its extremity, multiarticulate. It extends forward to near the middle of the superior pair, where it is folded back upon itself

* I will state, for the benefit of future collectors in this field, that my collection was preserved un mutilated by mounting the specimens, as soon as caught, in cells upon glass slides.

beneath the body. The apex of the flagellum reaches nearly to the posterior extremity of the cephalothorax when in this folded condition. The total length of the inferior pair is one-third greater than the superior pair.

The other parts that were mutilated in Dana's specimen were the posterior stylets. A description of these will therefore complete the account of the entire animal.

The outer caudal lamellæ are longer than the inner; both are lanceolate in shape, and serrated along their edges. The two stylets terminating the caudal segment are linear, and of the same length as the outer caudal lamellæ. Two short stylets articulate with the outer edge of the first just above the middle, and reach exactly half way to the terminal point. The fifth and sixth abdominal segments are much narrower than the preceding, and are apparently consolidated.

HYPERIDÆ.

HYPERINÆ.

LESTRIGONUS RUBESCENS, Dana.

Lestrigonus rubescens, DANA, U. S. Expl. Exped. Crust., ii, 934, pl. 67, f. 9.—SP. BATE, Cat. Amphi. Crust., 290, pl. xlviii, f. 5.

Locality: North Pacific Ocean. Latitude 1° north; longitude 122° west. Collected May 7, 1873.

My reasons for retaining the genus *Lestrigonus* will be given under *Hyperia tricuspidata*.

HYPERIA TRICUSPIDATA, n. sp.

Head large, deeper than broad, irregularly quadrangular from a lateral view, excavated in front. Eyes large, occupying most of the lateral portion of the head. Superior antennæ shorter than the head, stout; base short, four-jointed; first joint longest, distal end enlarged; the second, third, and fourth short, together shorter than the first; flagellum broader than the peduncle, oval, acute at the apex, about three times as long as the base, unarticulate; a few long auditory cilia at apex; a single row of short hairs on the inferior surface. Inferior antennæ rise from the inferior portion of the head, near the buccal region; more than twice as long as the superior pair; peduncle four-jointed; first and second joints long; first about half the length of the second, extending to the anterior margin of the head, but not exposed beyond it; second joint

slender, cylindrical, and the entire length of its upper border closely set with short, equidistant hairs, curled at their tips; third and fourth joints short, subequal, about one-quarter the length of the second, a few hairs on their upper surface; flagellum linear-lanceolate, in length almost equal to the second joint of the base, uniarticulate, pointed, with seven or eight slight serrations along the superior edge, one or more hairs at each serration. The second joint is directed upward and outward, and the third, fourth, and flagellum are bent downward, nearly at a right angle with the second. When the animal is at rest, the inferior antennæ are evidently folded up, in this manner, in the concavity in the front of the head.

The two pairs of gnathopoda unequal and unlike; the first pair shorter, and more robust than the second; meros produced antero-inferiorly, at its extremity a number of stiff hairs, slightly curled at their tips; carpus broad, produced inferiorly, but not anteriorly, with its anterior edge straight, and armed at the inferior angle with two stout spines or bristles; propodus shorter than the carpus, and about one half as broad; dactylus very minute. The second pair has none of the joints produced; meros short, about one-fourth the length of the carpus; the latter slender and cylindrical; propodus shorter than the carpus, and about the same breadth, with its distal extremity slightly produced on either side of the dactylus to an acute point, which is almost as long as the short dactylus. This arrangement probably compensates for the lack of the subchelate development of the carpus.

The depth of the thorax decreases slightly posteriorly. The five pairs of thoracic feet subequal; the two anterior pairs directed forward, with the last two joints flexed backward; the three posterior pairs directed backward, with the tarsus and claw flexed forward; a few short hairs set equidistant along the posterior margin of the two anterior, and on the anterior margin of the three posterior, pairs of legs.

The peduncles of the anterior abdominal appendages broadly elliptical, decreasing in size posteriorly. Of the three posterior pairs of abdominal appendages the ultimate are the longest; the preceding pairs nearly subequal; the rami of the antepenult (external) the longest, of the ultimate pair the shortest; rami serrated. Telson short, lanceolate.

Another specimen, a female with an incubatory pouch attached containing young, was captured at the same time as the one just described; and while the two differ widely in some respects, they have in common

the essential specific character that immediately distinguishes *H. tricuspidata* from all others of the same genus; namely, the peculiar structure of the second pair of gnathopoda. The head is larger in the female, but the general shape is the same; the thorax is shorter and deeper, and the last segment is much narrower; the abdomen is also narrower. The character of the superior antennæ is the same in both, except that in the female they are much smaller, and the joints are more plainly visible. The inferior antennæ, however, are quite different. They do not extend at all, or very slightly, beyond the anterior margin of the head. The first basal joint is very short, and broader than the following; the second long, and reaches nearly to the anterior margin of the head; the third joint is rudimentary; and the fourth is apparently obsolete. The flagellum is small, about one-third the length of the first joint, lanceolate in shape, and with two or three stout cilia at its apex. The shortening is chiefly due to the diminished length of the first joint of the peduncle. The posterior pair of thoracic legs are slenderer and shorter than the preceding pairs. The peduncles of the anterior abdominal appendages are ovate, instead of being elliptical; the posterior appendages show no differences.

Length of male .30 inch; of female, .25 inch.

I cannot think that these differences are anything more than sexual, on account of the strong specific resemblance there is between the specimens. Carcinologists generally have adopted the conclusion that *Lestrignus* is the male sex of *Hyperia*, but at no time, I think, has there been sufficient evidence at hand to justify this conclusion. I know no better reason for the supposition, than that they are occasionally found associated together, joined with the fact that certain others of the *Hyperidea* show a similar sexual difference; namely, in the length of the antennæ. In the *Lestrignus*, however, there is not only a difference in the length, but a total change in the structure of the antennæ. What is here held to be a male bears no resemblance to a *Lestrignus*, but has all the generic characters of a *Hyperia*; and, while there is a modified growth, as in the former genus, the development of the antennæ is the same in both individuals.

Young.—Head narrow, quadrilateral. Superior antennæ short and stout, and situated nearer the superior margin of the head than in the adult; the first basal joint as long as the three terminal ones; the second longer than the third, and their breadth less than that of the first; the fourth joint small, and either rounded or broadly triangular, with

rounded apex; flagellum minute, linear, uniarticulate, with one or two cilia crowning the apex, as long as, or longer than, the flagellum. The inferior antennæ are represented by a small rounded tubercle, tipped by a cilia; situated just beneath the superior pair.

Thoracic feet ten in number, stout; claws strongly hooked. Gnathopoda rudimentary, neither pair produced at the carpus, or at the meros; readily distinguished from the following thoracic feet by their more slender development.

Locality: North Pacific Ocean.

VIBILINÆ.

VIBILIA EDWARDSI, *Sp. Bate.*

Vibilia edwardsi, SP. BATE, Cat. Amphi. Crust., 300, pl. xlix, figs. 6 and 7.

Locality: North Pacific Ocean. Latitude 40° north; longitude 127° west. Collected May 9, 1873.

The flagellum of the superior antennæ, with its anterior margin oblique, and fringed with a row of short spines, is highly characteristic of this species.

PHRONIMIDÆ.

PHRONIMINÆ.

PHRONIMA PACIFICA, n. sp.

Head large, broad and rounded on the top, tapering below to the oral apparatus, and excavated in front. Eyes both on the dorsal and lateral surfaces of the head. Thorax narrower than the head, its vertical diameter decreasing rapidly posteriorly; the last segment much longer than any of the preceding segments. Abdomen attenuated. Superior antennæ shorter than the head, two-jointed; first joint short; the second about twice as long as the first, with a few cilia at its apex. First pair of gnathopoda having the meros produced, and with the inferior margin furnished with minute spinules, one of which, larger and longer than the rest, at the apex; the superior border of the carpus arched, produced antero-inferiorly, and very slightly anteriorly; produced part not reaching half the length of the propodos; the anterior margin closely set with acute, triangular teeth; one at the inferior apex, long and slender; the inferior margin finely serrated; propodos about the same length as the superior border of the carpus, cylindrical, arcuate, slightly taper-

ing toward the distal extremity, finely serrated on the inferior surface, and three or four longer spines on the superior surface; dactylos short, about one-fourth the length of the propodos, curved, and notched on the under surface, posterior to the apex; on either side of the base is a wing-like plate. The second pair of gnathopoda longer than the first pair, and the antero-inferior angle not produced to the same extent; in other respects they are similar. The first pair of thoracic feet shorter than the second, and much longer than the gnathopoda; the posterior margin of the carpus and propodus of both pairs minutely spinulose; dactylus minute. The third pair chelately developed; carpus large, irregularly quadrilateral, almost as broad as long, the inferior surface rounded, and the antero-inferior angle produced as a long tooth; on the middle of the anterior surface is a large crenulated tubercle, from which rise five or six long, straight hairs. In specimens from the .15 to the .20 of an inch long, there are, in the position of the tubercle, two or three sharp, prominent teeth, springing from a slightly-raised base; and the angle of the carpus is less projecting in the same specimens. Propodus bowed; when flexed on the carpus reaching to the apex of the tooth at the inferior angle—in smaller specimens somewhat longer; a low convexity on the inferior surface opposite the crenulated tubercle of the carpus; the prominence not crenulated; inferior surface bimarginate. Dactylus present, minute. The posterior apex of the coxa of the third pair acute, prominent; the meros projecting posteriorly and rounded. The two posterior pairs of thoracic feet subequal, shorter than any of the preceding pairs. Telson rudimentary.

Length of the larger specimens, .40; smaller, .15 of an inch.

Locality: North Pacific Ocean. Latitudes 4° and 21° north; longitudes 127° and 151° west. Collected May 9 and 20, 1873.

This species is distinguished from *P. sedentaria* by the broadly-quadrate form of the carpus of the third pair of thoracic feet, and by having the carpus of the gnathopoda less produced anteriorly. In other respects they are similar. The shape of the hand more nearly resembles the hands of *P. custos* and *P. borneensis*; but it is distinguished from both of the latter, by the character of the anterior surface of the carpus and of the propodus. In the latter both the carpus and propodus are furnished with a crenulated tubercle; in *custos* the tubercle is single and tooth-like. There is a striking resemblance between the propodus, and the anterior surface of the carpus of the third pair of thoracic feet, of the smaller specimens of *pacifica*, and the corresponding parts of *P.*

atlantica, which is said to be the female of *sedentaria*; the broad band, however, separates them.

It is a remarkable fact, that in all the species of *Phronima* that have been described, even from widely-separated localities, the variation is very slight indeed.

ANCHYLONYX, nov. gen.

Head moderately large, broad and rounded at the top, tapering inferiorly to the oral apparatus, and excavated in front. Eyes on the lateral and dorsal surfaces of the head. Both pairs of antennæ present, long; base of the superior pair long and stout, three-jointed; inferior pair slender, four-jointed; flagellum very attenuated and elongated. Thorax broad, somewhat compressed; segments six. Abdomen narrow. The gnathopoda not subchelate, nor much reduced in size, when compared with the following feet; the first and second pairs of thoracic feet long, slender; carpus and meros linear. The third pair enlarged; carpus and meros dilated, with the anterior margin armed with teeth; propodus flexes on the carpus, impinging against the teeth on its anterior margin; dactylus fused with the propodus. The fourth and fifth pairs of feet subequal, shorter than the preceding. The three posterior pairs of abdominal appendages biramous, lanceolate; rami pointed.

This genus is very closely allied to *Phronima*. It differs only in the character of the antennæ, the gnathopoda, and in the less perfectly developed chelæ of the third pair of thoracic feet. The shape of the head, the thorax, and the abdomen are almost identical, and there are likewise eye-facets on the dorsal surface of the head. The mandibles are without appendages; and the first and second, and the fourth and fifth pairs of thoracic feet are similar to those of the genus above named, as are also the three posterior pairs of abdominal appendages. A pair of wing-like plates exist at the base of the dactylus of both pairs of gnathopoda. These, I believe, have previously been peculiar to *Phronima*. The character of the gnathopoda and the third pair of thoracic feet allies the genus with *Primno*; in the structure of its antennæ it differs essentially from both.

Anchylonyx forms a bond of union between the two subfamilies of Bate's—the PHRONIMIDES and PIROSIMIDES, which are founded upon the structure of the three posterior pairs of abdominal appendages in the different genera representing the family PHRONIMIDÆ. In his arrangement he separates *Primno* from *Phronima*, which, together, con-

stitute Dana's subfamily PHRONIMINÆ. The fact that the two genera come together again, and mingle their characters in *Anchylonyx*, rather proves that the position which Dana assigned to them is the correct one, and that the characters which he used for the subdivision of the family are of more importance, than those adopted by Bate.

ANCHYLONYX HAMATUS, n. sp.

Head of moderate size, rounded above and pointed below, deeply concave in front. The lateral lenses of the eye arranged in the form of a rosette, and situated in a rounded projection on the lower portion of the head, directly above the origin of the inferior antennæ. A number of solitary lenses scattered over the lateral and dorsal surfaces of the head, and connected by long and filamentous nerve-fibers with the inferior eyes. The superior antennæ nearly as long as the cephalothorax; first joint of base short and broad; second extremely short, about one-third the length of the first; third joint slightly longer than the head, lanceolate, inferior edge densely hairy, apex inferiorly produced; first and second joints of the flagellum subequal, together about as long as the third; third and fourth subequal; remainder of flagellum lost. Inferior antennæ more slender than the superior pair, very long; flagellum very much attenuated, filamentous, one-half, or more than one-half, the length of the body; peduncle four-jointed—three of which are exposed beyond the anterior margin of the head; first joint short and broad; second longer than the rest, slightly oval; fourth narrower, bent slightly upward; joints of flagellum elongate—the first the longest; the remainder subequal. The under surface of the flagella of both pairs furnished with long, equidistant hairs.

Segments of the thorax six; the first and second soldered together; the five anterior subequal; the sixth (the seventh normal) narrows posteriorly, and is nearly as long as the two preceding. First pair of gnathopoda shorter and slenderer than the second; meros of the same length as the preceding joint, slightly produced inferiorly at the distal extremity—the produced portion finely serrated below and anteriorly, at the angle one of the serrulations produced to a fine acicular spine; carpus long, at inferior apex a slender spine; propodos somewhat shorter than the carpus, arched; dactylus about one-half the length of the propodos, arched, acute, notched below the apex, with a wing-like plate on either side of base. The carpal and meral joints of the second pair of gnathopoda neither produced, nor spiniferous; dactylus less than one-half the length of the

propodos; with these exceptions the second pair is similar to the first. First and second pairs of thoracic feet longer than the third; the first pair longer than the second; the external surface of the coxæ ridged along the middle, with posterior angles acute, spinous; all the joints narrow and elongate; claw anchylosed with the tarsus, and fixed at a right angle to it; the apex of the tarsus produced in the form of a long, straight, acute spine. The third pair of thoracic feet enlarged, more robust than the others, with coxa ridged on the middle of the external surface, and with the anterior and posterior margins armed with short, stout spines; meros slender, convex posteriorly, and anteriorly concave; anterior surfaces of the carpus and meros armed with long, sharp teeth—three on the latter, and seven on the former; the fifth tooth, counting from the base of the carpus, much larger and longer than the others; carpus somewhat clavate in shape, the anterior extremity enlarged; propodus about half the length of the carpus, arched; dactylus small, anchylosed, fixed at a right angle to the propodos. Fourth and fifth pairs of feet sub-equal, shorter than the preceding, with the anterior angles of coxæ spinous; in other respects similar to the preceding.

Abdomen narrow; the three anterior segments gradually diminishing in length posteriorly; the fourth very narrow. The peduncles of the anterior appendages broadly oval; the rami short and slender, multi-articulate; the posterior appendages slender, lanceolate, biramous, acute; the outer pair extending half way the rami of the terminal pair; the inner pair short, terminating at the commencement of the rami of the outer pair. Telson minute, rudimentary.

Length, .40 of an inch.

Locality: North Pacific Ocean. Latitude 34° north; longitude 150° west. Collected June 25, 1873.

PHROSININÆ.

ANCHYLOMERA THYROPODA, Dana.

Anchylomera thyropoda, DANA, U. S. Expl. Exped. Crust., ii, 1004, pl. 68, f. 10.—SP. BATE, Cat. Amph. Crust., 325, pl. lii, f. 6.

Locality: North Pacific Ocean.

I identify this species with Dana's, which came from the Atlantic Ocean, on account of the peculiar form of the antennæ. These organs are curved downward and outward, and are closely applied to the surface of the head. In one specimen the antennæ were absent altogether;

and I, therefore, do not believe their small size and peculiar form to be due to age; their presence is rather a sexual characteristic.

The inferior distal angle of the propodos of the third and fourth pairs of thoracic feet is produced, and when the joint is flexed this projection impinges against the antero-inferior angle of the carpus. This character is not mentioned in Dana's description. In other respects they are almost identical.

Length, .10 to .15 of an inch.

PLATYSCCELIDÆ.

PLATYSCCELUS BATEI, n. sp.

Head, when viewed from above, broadly rounded; the center of the anterior margin produced in the form of a beak, which is directed downward. The peduncle of the superior antennæ truncated; the inferior distal extremity furnished with two bunches of auditory cilia, one posterior to the other; flagellum two-jointed. Inferior antennæ short, four-jointed; first joint the longest; second and third subequal; fourth joint broadly rounded at apex, longer than the third; terminating in a minute flagellum, acute and curved at the apex, and base broader. The whole antenna is concealed beneath the lateral portion of the head. The thorax narrower at either extremity than in the middle, somewhat barrel-shaped when seen from above; first and second segment short, almost concealed in the middle of the dorsum by the overriding of the third. The first pair of gnathopoda shorter and slightly stouter than the second; in other respects they are similar; shorter and more robust than the following thoracic feet; neither carpi nor mera produced anteriorly, the latter broader than the former, neither serrated; the inferior margins furnished with a few long setæ; propoda about the same length as the carpi, narrower, cylindrical, not serrated; dactyla short. The first pair of thoracic feet shorter than the second; coxæ of both pairs elongate, somewhat clavate; the mera, carpi, and propoda subequally long; dactyla short, curved. Coxa of third pair subelliptical, not serrated; apex obtusely rounded; anterior margin furnished with five or six short, equidistant setæ; the remaining five joints articulating with coxa subapically, together as long as the coxa; at the inferior apex of the third joint is a single long seta. Coxa of the fourth pair broad, arcuate posteriorly, and excavate anteriorly; distal extremity obtusely rounded at the apex,

and oblique posteriorly; the ischium short, articulating with the posterior margin of coxa near the center, and opposite the angle formed by the posterior oblique margin; the remaining joints about one-third the length of the coxa; the first joint following the ischium longer than the three terminal ones; the inferior margin produced anteriorly; all finely serrated on the posterior margin. Of the fifth pair the coxa only developed; membranous, broad, about one-third the length of the coxa of the fourth pair. Abdomen narrower than the thorax; segments gradually decreasing in breadth posteriorly; longer than the thoracic segments. Posterior abdominal appendages foliaceous, biramous; the details of their structure similar to those of *P. rissoinae*. Telson broadly triangular, apex obtuse.

Length, .12 of an inch.

Locality: North Pacific Ocean. Latitude 21° north; longitude 151° west. Collected May 20, 1873.

This species is closely related to *P. rissoinae*; the differences are chiefly in the structure of the gnathopoda, and of the third and fourth pairs of thoracic feet. The gnathopoda bear a striking resemblance to those of the young of *P. serratus*, but as the rest of the structure of the animal shows no evidence of immature development, this is undoubtedly their normal adult condition.

I dedicate the species to the eminent English carcinologist, C. Spence Bate, who, more than any other writer on the subject, has helped to elucidate this order of Crustacea.

AMPHIPRONOË SERRULATA, n. sp.

Head rounded; superior surface slightly convex, longer than the inferior surface; antero-inferior angle obliquely rounded, less projecting than the antero-superior; front hollowed; eyes diffused, covering the greater portion of the lateral surfaces of the head. Superior antennæ short, peduncle three-jointed; the third joint large, slightly produced antero-inferiorly; inferior surface convex, and densely covered with long hairs; flagellum articulating with superior margin of third joint subapically, triarticulate, having at the apex of each articulus two or more long auditory cilia. Inferior antennæ five-jointed, folded four times, and concealed beneath the head; first three joints subequal; fourth about two-thirds the length of the preceding; fifth very short; margins of all the joints shortly ciliate. The three anterior segments of the thorax narrower than the following; the four posterior subequal, gradually in-

creasing in length posteriorly. First pair of gnathopoda having the meros broad distally; carpus broad, antero-inferiorly produced nearly to the apex of the propodos; the apex of the produced portion obtuse, finely serrulated on both margins; propodos oblong-ovate, slightly longer than the produced angle of the carpus, inferior margin serrulated; dactylus short. Second pair of gnathopoda longer than the first; carpus produced inferiorly, but not anteriorly; antero-inferior angle obliquely rounded and sharply serrated; propodos longer than the carpus, the superior margin arcuate, inferiorly straight, not serrated; dactylus half the length of propodos, slender, arcuate. First and second pairs of thoracic feet long, all the joints following the coxæ closely serrated along their flexible margins; claws long, slender, acute, almost as long as the preceding joint. Third pair having coxa dilated, and anterior margin nearly straight, the posterior broadly convex; the remaining joints, resembling the corresponding joints of the first and second pairs, longer than the coxa, and articulating with its apex near the anterior angle. Fourth pair having the coxa more dilated than the third, form similar; the remaining joints shorter than the coxa, but with the flexible margins serrated like the preceding pairs; the coxa of the fifth pair broad, much smaller than the two preceding; ischium rudimentary; the remaining joints obsolete. Segments of the abdomen much longer than those of the thorax, decreasing in length and breadth posteriorly; the posterior lateral angles of the three anterior segments produced, acute; the fourth and fifth segments do not coalesce; the fifth is extremely abbreviated, but distinct; on account of its small size the antepenultimate and penultimate caudal lamellæ appear to rise together from the postero-inferior angle of the fourth segment, but in reality they do not; the penultimate pair rises from the fifth; these lamellæ are subequal, with peduncles short and rami long, extending almost to the extremity of the ultimate pair, ovate-lanceolate, acutely serrated on both margins; peduncles of ultimate pair very short, rami similar to the preceding, extending a short distance beyond the extremity of the telson. The latter triangular, apex obtuse.

Length, .15 of an inch.

Locality: North Pacific Ocean. Latitude 21° north; longitude 151° west. Collected May 20, 1873.

OXYCEPHALIDÆ.

OXYCEPHALUS TUBERCULATUS, *Sp. Bate.*

Orycephalus tuberculatus, SP. BATE, Cat. Amphi. Crust., 343, pl. liv, f. 5.

Locality: North Pacific Ocean. Latitude 5° north; longitude 128° west. Collected May 10, 1873.

Although taken in a widely-distant locality, there is no doubt of the identity of this species with that described by Bate. The row of dorsal tubercles, one anterior and one posterior, on each segment of the body, the structure of the second pair of gnathopoda, and the rudimentary character of the posterior pair of thoracic legs—falling short of the base of the preceding pair—at once determines the species. They also agree in the minor details of structure, as far as they are given by the author. The head and first thoracic segment were wanting in his specimen. I will therefore supply the omission in his description by an account of the parts as they exist in the present specimen.

Head not quite as long as the first five segments of the thorax, broad, inferior margin broadly convex; rostrum more than half the length of the head, triangular, acute; eyes large, covering the whole of the lateral surfaces of the head; the superior antennæ broad, compressed; peduncle three-jointed; first joint longer than the second; the latter short; the third longer than the first and second, and having on the upper surface near the apex a few auditory cilia; flagellum uniaarticulate, short, slender, slightly bent upward, and apex furnished with a few long auditory cilia. Inferior antennæ absent in the specimen. The first pair of gnathopoda shorter than the second, but similar to them in other respects; carpus produced anteriorly nearly to the apex of the propodos, margins furnished with a few long setæ, not serrated; propodos subovate; dactylus nearly half as long as the propodos. The flexible margins of the following thoracic feet furnished with a few setæ, or hairs.

Length, .40 of an inch.

LEPTOCOTIS, nov. gen.

Animal long and slender. Head large and produced anteriorly into a rostrum; narrowed behind the eyes; the constricted portion short, and not narrower than the thorax; under surface excavated anteriorly on each side for the reception of the superior antennæ. Superior antennæ short, sickle-shape. Inferior antennæ five-jointed, folded upon them-

selves four times, and concealed beneath the head; first and second joints distally enlarged. An elongate mandibular appendage. Gnathopoda short, and complexly chelate. Third and fourth pairs of thoracic feet having the coxæ dilated; the fifth pair small. Fourth and fifth abdominal segments fused into one; sixth small. Caudal appendages long, biramous. Telson cylindrical, long.

This genus exhibits a remarkable blending of the characters of *Oxycephalus* and *Rhabdosoma*. The general form of the animal is that of *Oxycephalus*; the short neck and elongated rostrum show a tendency toward *Rhabdosoma*. Both pairs of antennæ, the abdomen, and caudal appendages are identical with the corresponding parts in the latter genus; while the three posterior thoracic feet are a repetition of the former. A similarly elongated mandibular appendage is observed in *Rhabdosoma whitei*.

LEPTOCOTIS SPINIFERA, n. sp.

Head long, with the rostrum longer than the thorax; vertical diameter of the head greater posteriorly than anteriorly; the superior surface on a higher level than the dorsum of the thorax; abruptly constricted behind the eyes and in front of the first thoracic segment; the inferior border slightly convex; the under surface hollowed out on each side anteriorly in the form of fossæ for the reception of the superior antennæ; supra-fossal margin arched and slightly elevated; rostrum long, acute, slightly arched. Eyes covering the whole of the lateral and dorsal surfaces of the head posterior to the superior antennæ. Superior antennæ sickle-shaped; peduncle broad, three-jointed, with margins densely hairy, particularly the inferior margin; second joint short; the third longer than the first and second together, compressed, bent forward at its articulation with the second joint, and its anterior inner apex produced as a long, acute process, which is almost at a right angle with the main portion of the joint; base of process enlarged; flagellum articulating with the anterior surface of the base of the process, and shorter than the process, biarticulate, each articulus having three or four long auditory cilia. Inferior antennæ five-jointed, folded upon themselves four times, and hidden in a groove on the under surface of the head; the first, second, and third joints equal in length; the first and second enlarged at their distal extremities; fourth joint a little shorter than the preceding; fifth very short, with one or two auditory cilia at its apex. The mandibular appendage long, slender,

reaching nearly to the apex of the first joint of the inferior antennæ; first joint long; second and third short.

Thorax seven-jointed; segments increasing in length posteriorly; epimerals long, broadly ovate, transversely rugose. Gnathopoda short, chelate; the second pair longer than the first; carpus of first pair scarcely produced anteriorly, anteriorly and inferiorly serrated; propodos broad, serrated on inferior margin; dactylus half the length of the propodos, arched, with a minute spine about the middle of the inferior surface, antagonizing with the extremity of the carpus. Second pair having the carpus more produced anteriorly than the first, extending to, or slightly beyond, the apex of the propodos, and terminating in a long, fine point; propodos and dactylus similar to the first pair. First and second pairs of thoracic feet shorter than the third, slender; third and fourth pairs having the coxæ dilated; the fourth more dilated than the third, and the remaining joints shorter, and closely serrated along the entire anterior margin—the first joint coarsely serrated, the next finely, and the third intermediate between the two preceding—the other feet not serrated; fifth pair rudimentary, coxa dilated, small, with the remaining joints not half as long as the coxa of the preceding pair.

Abdomen having the three anterior segments normal, subequal; fourth and fifth fused into one; sixth short; the dorsal surface of each segment marked by a shallow, transverse depression near the anterior extremity of the joint; that on the fourth segment deeper than those preceding it; a long, acute spine, pointing upward, on each side of the fifth, directly above the articulation of the outer caudal lamella. Caudal appendages long, cylindrical, serrated along their inner margins, biramous; outer pair longer than the two following; ultimate short, reaching further than the inner. Telson long, cylindrical, extending beyond the extremities of the lamellæ.

Length, .50 of an inch.

Locality: North Pacific Ocean. Latitude 29° north; longitude 157° west. Collected June 16, 1873.

CALANIDÆ.

CALANINÆ.

CALANUS SANGUINEUS, Dana.

Calanus sanguineus, DANA, U. S. Expl. Exped., Crust., ii, 1070, pl. 73, f. 11.

Locality: North Pacific Ocean. Latitude 21° north; longitude 153° west. Collected May 21, 1873.

CALANUS MUNDUS, Dana.

Calanus mundus, DANA, U. S. Expl. Exped. Crust., ii, 1071, pl. 74, f. 2.

Locality: North Pacific Ocean. Latitude 21° north; longitude 153° west. Collected May 21, 1873.

The specimens of *C. mundus* were taken at the same time with the *C. sanguineus*. A similar statement is made by Dana. The differences pointed out by that writer were observable in the present specimens, yet they probably have a closer relationship than he gives to them.

EUCALANUS ELONGATUS, Streets.

Calanus elongatus, DANA, U. S. Expl. Exped. Crust., ii, 1079, pl. 75, f. 1.

Locality: North Pacific Ocean. Latitude 1° north; longitude 122° west. Collected May 7, 1873.

The general shape of *E. elongatus* and *E. attenuatus* is so very different from the form of the typical *Calanus*, that I think we are justified in considering them under a distinct generic title. I adopt that which Dana suggested for *attenuatus*, in consequence of "the multiarticulate character of the smaller branch of the posterior antennæ." This character, I am disposed to believe, belongs to *elongatus* as well as to *attenuatus*; at least, a specimen examined by me shows unmistakable evidence of it.

PONTELLINÆ.

CANDACE ETHIOPICA, Dana.

Candace ethiopica, DANA, U. S. Expl. Exped. Crust., ii, 1115, pl. 73, f. 5.

Locality: North Pacific Ocean. Latitude 21° north; longitude 153° west. Collected May 21, 1873.

Our specimens differ from Dana's *ethiopica* in some respects, but they evidently do not constitute a new species. The cephalothorax is five-jointed, instead of four, the second joint being short; the right posterior angle of the last joint has a minute projection on its outer side near the apex. This projection was not observed on the left side, and it was only present in the single male specimen. The sixteenth joint of the anterior antennæ, or that one following the geniculation, presents both extremities closely pectinated, while there is a short space in the middle that is bare; the proximal extremity of the following joint shows a few short pectinations. The abdomen is five- or six-jointed, and on the right side of the first segment is an acute spinous process, black at the tip.

The female presents the following differences. There is no geniculation, nor pectinations, on the right anterior antenna; the acute posterior angles of the cephalothorax are produced equally, and bent slightly outward, the right not black at the tip. The abdomen is four-jointed; the second joint is the largest, rounded laterally and gibbous below, and the posterior lateral angle on each side is produced into short acute processes; in the center of the protuberance below is a deep black spot.

It will be observed that some of the characters mentioned above belong to *Candace curta*. The females show a decided likeness to the same sex of *C. pachydactyla*. The only difference of any importance that I can see in the three species, is in the structure of the right posterior foot of the male. Future research will probably determine them to be but a single species with individual variations. The structure of the right anterior antenna of the male is a strong specific character.

PONTELLINA DETRUNCATA, Dana.

Pontellina detruncata, DANA, U. S. Expl. Exped. Crust., ii, 1143, pl. 80, f. 7.

Locality: South Pacific Ocean. Latitude 10° south; longitude 110° west. Collected May 1, 1873.

PONTELLA FERA, Dana.

Pontella fera, DANA, U. S. Expl. Exped. Crust., ii, 1169, pl. 82, f. 5.

Locality: South Pacific Ocean. Latitude 23° south; longitude 94° west. Collected April 24, 1873. Specimen male.

CORYCÆIDÆ.

CORYCÆINÆ.

ANTARIA OBTUSA, Dana.

Antaria obtusa, DANA, U. S. Expl. Exped. Crust., ii, 1230, pl. 86, f. 13.

Locality: North Pacific Ocean. Latitude 5° north; longitude 128° west. Collected May 10, 1873.

The claw of the anterior feet is not as long as the preceding joint; the caudal stylets are about one-third the length of the abdomen, and the two external setæ, instead of being but little more than the diameter of the stylets in length, equal one-half, or more than one-half, their length.

COPILIA MIRABILIS, Dana.

Copilia mirabilis, DANA, U. S. Expl. Exped. Crust., ii, 1232, pl. 86, f. 14.

Locality: South Pacific Ocean. Latitude 8° south; longitude 113° west. Collected May 2, 1873.

The cephalothorax increases in breadth behind the conspicilla to about the middle of the first segment, where there is a slight angle. Posterior to this angle, the sides of the segment are very nearly parallel. Abdomen is five-jointed. The first and second articulations are nearly obsolete; the third and fourth distinct. The posterior extremities of the third and fourth joints are surrounded by a ring of minute spines; the fifth joint is slender, longer than all the preceding together; at each outer angle of the posterior extremity of the fifth joint is a short spine, and likewise one above and one below on each side. The caudal stylets are long and divergent, with a short, slender seta on their outer margin at the junction of the upper-fourth with the lower three-fourths of their length; the extremity is furnished with four setæ, those at the angles short and slender; the two middle ones long and stout.

SAPPHIRINA CORUSCANS, Dana.

Sapphirina coruscans, DANA, U. S. Expl. Exped. Crust., ii, 1243, pl. 87, f. 6.

Locality: North Pacific Ocean. Latitude 1° north; longitude 122° west. Collected May 7, 1873.

Body ten-jointed; the tenth small, concealed beneath the ninth. Caudal lamellæ having a tooth on the inner side near the apex. In this latter character it resembles *S. orientalis* and *S. ovalis*.

BOTANY.*

Plants of the Pacific Islands.

CRUCIFERÆ.

LEPIDIDIUM OAHUENSE, *Cham. & Schlecht.*

Localities: Palmyra and Washington Islands. Common.

MALVACEÆ.

SIDA DIELLI, *Gray.*

Locality: Christmas Island.

ZYGOPHYLLACEÆ.

TRIBULUS CISTOIDES, *Linn.*

Locality: Christmas Island.

SIMARUBACEÆ.

SURIANA MARITIMA, *Linn.*

Localities: Christmas and Palmyra Islands. Common on all the islands of the Fanning Group.

LUGUMINOSÆ.

CANAVALIA GLANDIFOLIA.

Locality: Washington Island.

FICOIDEÆ.

SESUVIUM PORTULACASTRUM, *Linn.*

Locality: Christmas Island.

* Dr. Gray's paper has not been received up to the time of going to press; and we are, therefore, obliged to exclude the plants from the peninsula of Lower California from this Bulletin. An account of them will be published elsewhere.

GOODENOVIACEÆ.

SCÆVOLA PLUMIERA, *Vahl.*

Locality: Christmas Island. A low, spreading shrub, branching from the ground. Flowers white, with purple edges; resembling the flower of a *Lobeliaceæ*.

BORRAGINACEÆ.

HELIOTROPIUM ANOMOLUM, *Hook. & Arn.*

Locality: Christmas Island.

NYCTAGENIACEÆ.

BOERHAAVIA HIRSUTA, *Linn.*

Locality: Christmas Island.

CYPERACEÆ.

SCIRPUS RIPARIUS.

Locality: Washington Island. Covering the surface of the shallow fresh-water lagoons of that island.

FILICES.

POLYPODIUM AUREUM, *Sw.*

Localities: Palmyra and Washington Islands. Common.

PTERIS AQUILINA, var. CAUDATA, *Linn.*

Locality: Oahu.

ASPLENIUM NIDUS, *Linn.*

Localities: Palmyra and Washington Islands. Very abundant on the windward side of the former.

ASPLENIUM POLYPODIOIDES, *Mett.*

Locality: Oahu.

NEPHROLEPIS EXALTATA, *Schott.*

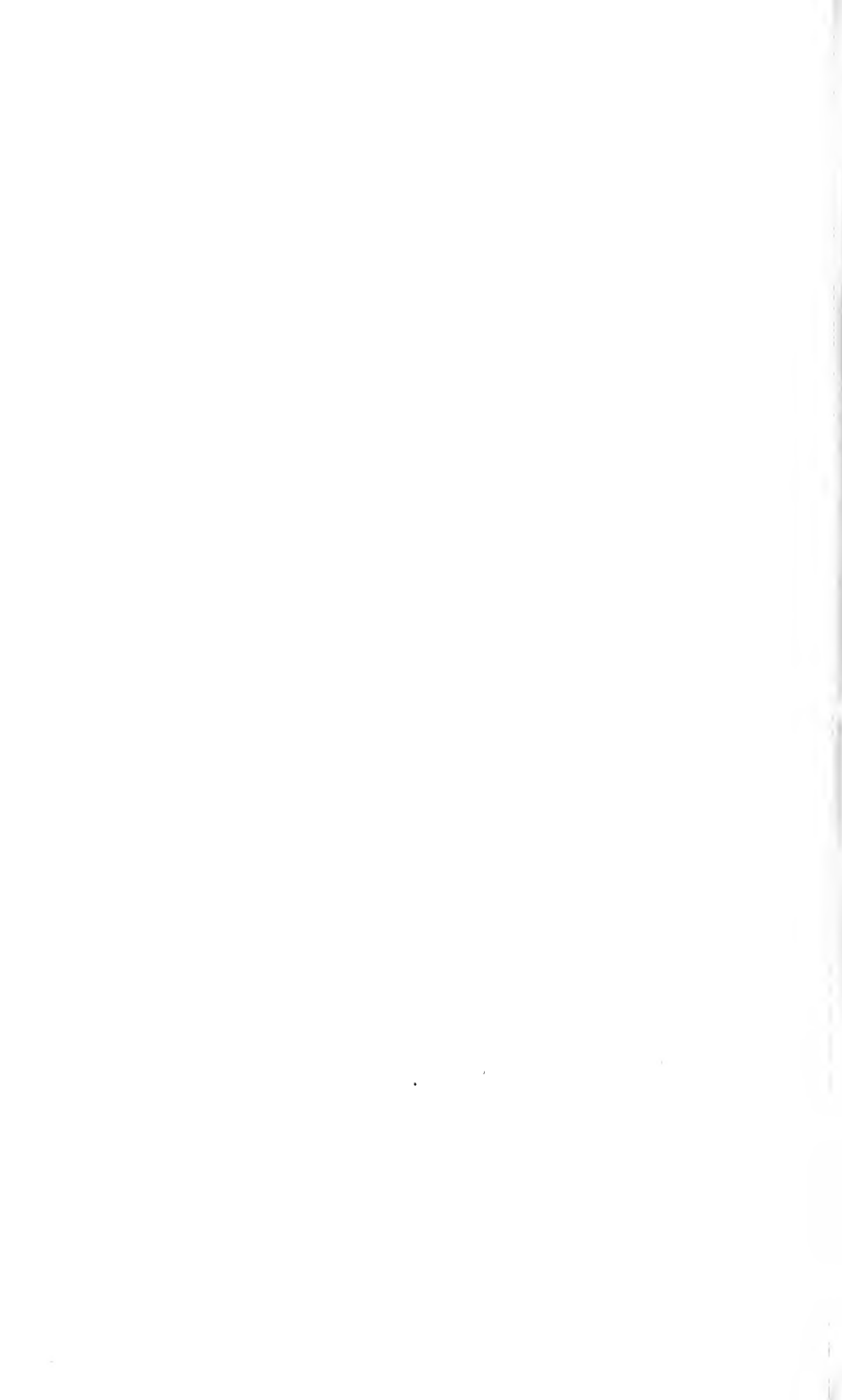
Locality: Washington Island. Not growing on Palmyra.

DAVALLIA TENUIFOLIA, *Sw.*

Locality: Oahu.

DAVALLIA SPELUNCEA, *Baker.*

Locality: Oahu.



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Department of the Interior:

U. S. NATIONAL MUSEUM.

— 8 —

BULLETIN

OF THE

UNITED STATES NATIONAL MUSEUM.

No. 8.

PUBLISHED UNDER THE DIRECTION OF THE SMITHSONIAN INSTITUTION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1877.

ADVERTISEMENT.

This work is the eighth of a series of papers intended to illustrate the collections of natural history and ethnology belonging to the United States and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

JOSEPH HENRY,

Secretary of the Smithsonian Institution.

SMITHSONIAN INSTITUTION,

Washington, May, 1877.

INDEX

TO THE

NAMES WHICH HAVE BEEN APPLIED TO THE SUBDIVISIONS

OF THE

CLASS BRACHIOPODA

EXCLUDING THE RUDISTES

PREVIOUS TO THE YEAR 1877.

BY

W. H. DALL,

U. S. COAST SURVEY.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1877.



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INDEX OF NAMES APPLIED TO THE CLASS, ORDERS, TRIBES, FAMILIES, GENERA, SUB-GENERA, AND SECTIONS OF THE BRACHIOPODA (EXCLUDING THE RUDISTES) PREVIOUS TO THE YEAR 1877.

BY W. H. DALL,
United States Coast Survey.

INTRODUCTION.

The names herein enumerated comprise all the appellations which have been given to the various divisions of the *Brachiopoda* as far as they could be collected from the works accessible to me. It is believed that the list is nearly complete so far as relates to names applied under the Linnæan system of nomenclature.

Non-binomial and pre-Linnæan names which have been quoted in synonymy, errors of pen or types, and groups of similar appellation, but differing in scope, have all been included so far as they are to be found in the standard works on the subject. The number of names due to typographical errors could have been largely increased had reference been made to minor papers and publications, but this was not thought necessary or desirable. Since some, and in fact most, of those indexed have been quoted or printed in standard works on the subject, it would have been inadvisable to have omitted them entirely.

The object of the index is rather to enable students to construct their own synonymy, according to such rules of nomenclature as they may prefer, than to attempt a wholesale revision here. On this account, the references have been freed, whenever possible, from expressions of individual opinion, and are intended to convey an exact idea of the facts. The notes which follow the references as explanatory matter are framed in accordance with the original rules of the British Association, excepting that the date of the proposition of the Linnæan nomenclature is taken as from the tenth edition of the *Systema Naturæ*, where (in my opinion) it properly belongs, instead of the twelfth edition, as originally proposed by the association committee. This differ-

ence would affect but one or two unimportant names among those in the index, and would seem to be a necessary concession to a simple matter of fact.

The absolute synonymes resulting from the foundation of different genera on the same species, and some which are generally admitted by the majority of authors, have been indicated whenever known. In some cases, the compiler has exercised his own judgment in inserting a reference to synonymy. In every case, however, the student is requested to refer to the citations of the index, upon which the compiler's indications of synonymy are based, and from them to form his own conclusions.

It has been attempted to give in full the *locus*, date, and reference to figures (if any) appertaining to each original generic or other description; with a reference to the original description of the typical species, when this is not coincident with the generic or sectional diagnosis, to indicate whether a diagnosis authenticated the introduction of a new name or not (silence on this point in the citation indicating that a proper diagnosis was made); to name and give citations for the type, if any was selected, or to state the first species if no type was named, and the types which have been adopted by subsequent students of the genus; and to give a reference to the best figure of the typical species known to the compiler.

This has been done whenever practicable, and a reference to the geological horizon of the type-species of a genus, with any notes which might tend to elucidate its standing, have frequently been added.

Nearly all the works referred to have actually been consulted. The only important exceptions are those of Fischer de Waldheim, König and one of Pander's minor papers. For an opportunity of consulting Pander's Beiträge I am indebted to the kindness of Prof. Alexander Agassiz, director of the Museum of Comparative Zoölogy at Cambridge.

When a publication was inaccessible, the fact is stated in the citation, which has then been derived from the works of Davidson, Bronn, Hermannsen, and other standard authorities. To the first-named gentleman and Prof. R. P. Whitfield, of Albany, I am under great obligations for numerous favors received during the preparation of this index, for the views expressed in which, however, I hold myself solely responsible.

The classification of generic names which follows the index is for the purpose of assisting the student to find at one reference all the binomial names which appear to belong to any one family. Some pre-Linnæan

names which have been widely quoted are also included. It must be kept in mind, however, that this classification is purely tentative, and that, with the exception of absolute synonymes, the discovery of the character of an interior, or the more complete elucidation of the characters of an obscure genus, may at any time give it a standing to which it is not at present entitled. For this reason, it is certain that no classification of so large a group of fossil forms as the *Brachiopoda* comprise can be anything more than tentative for many years to come.

The dates are in all cases intended to represent those of actual publication, a matter not always easy to determine. In some difficult cases, where the date of presentation of a MSS. appears on the title-page without any reference to the actual date of publication, the former is used as a numerator, and the earliest date for publication to which the paper is known to be entitled as a denominator, of a fraction in the date column.

It will not be a matter of surprise that, in giving references for good figures, the magnificent works of Mr. Davidson have almost constantly been drawn upon. Students are to be congratulated that these are among the most accessible works on the subject.

Since *Calceola* has for so long a period been referred to as a Brachiopod, or included with them, it has been decided to include its very copious synonymy, though it is now known, through the researches of Dr. Lindström, to belong to the *Coelenterata*.

A bibliography was originally contemplated in connection with the index, but it was soon found that, to make it complete, more time and space would be required than could conveniently be devoted to it.

It is hoped that few important mistakes exist in the list, though the character of the references is such as to render the work particularly liable to typographical errors. Not a few such errors which appear in earlier works of the kind have been corrected, and the indulgence of the reader is requested for any new ones which may unfortunately have crept in.

References have usually been made in a sufficiently full manner to be readily identified; a few exceptions are, therefore, noted.

Dav. 1853; to *A general Introduction to the Classification of the Brachiopoda*, by Thos. Davidson, F.G.S. &c. being *British Fossil Brachiopoda*, vol. i, art. iii, Paleontographical Society, London, 1853, 4to.

The references to the subsequent series of Monographs are made by the geological horizon; as, "Mon. Silurian Brach. p." &c.

Dav. 1856; to *Introduction à l'Histoire Naturelle des Brachiopodes Vivants et Fossiles*, par Thos. Davidson, Esq. traduit de l'Anglais par MM. Deslongchamps: in *Mémoires de la Société Linnéenne de Normandie*, x, pp. 69-271, Caen, 1856, 4to.

Dalm. Ter.; *to* Uppställning och Beskrifning af de i Sverige funne Terebratuliter; af J. W. Dalman; *in* Kongl. Vet. Acad. Handlingar för år 1827, pp. 85-180; t. i-vi, Stockholm, 1828, 8vo.

Chenu, Man.; *to* Manuel de Conchyliologie et de Paléontologie Conchyliologique, par le Dr. J. C. Chenu, t. ii, Paris, 1862, gr. 8vo.

Woodw. Man.; *to* A Manual of the Mollusca, or, a Rudimentary Treatise of Recent and Fossil Shells, by S. P. Woodward, &c. London, 1851-56, 12mo.

Paetel, Fam. u. Gatt. Moll.; *to* Die bisher veröffentlichten Familien- und Gattungsnamen der Mollusken, zus. von Fr. Paetel, Berlin, 1875, 8vo.

A work containing more and worse typographical and other errors than any other book, of a scientific tendency, known to me.

Regent's Rep.; *to the* (—) Annual Report of the Regents of the University, on the condition of the State Cabinet of Natural History, and the Historical and Antiquarian Collection annexed thereto. Made to the senate (—). Albany (New York), &c. 8vo. (Blue books.)

Of the series, Nos. III, IV, and VII to XXVII all contain, in the form of appendices, matter relating to the geology, mineralogy, paleontology, botany, general natural history, ethnology, or philology of America, chiefly that division of each subject relating to the State of New York. In each of these departments, some of the papers are of permanent value and importance, which need not be specified in relation to the long series of paleontological notices by Prof. James Hall and others. The third report appeared in 1850, and they have continued, at rather irregular intervals, to be issued for each year up to that for the year 1875, which is believed to be partly printed, (January, 1877). The title in each begins with the serial number of the report and ends with the date of presentation to the State legislature. The date at the bottom of the title-page is usually that of the year of presentation; but in this and in the verbal construction of the title the reports are not uniform. In the earlier ones, there is very rarely any date referring to the actual time of publication, which latter might differ from that on the title-page by a year or more. The appendices in which the scientific papers are comprised, should it be required, are subject to revision up to the time of publication. The latter date, in the case of those cited, has been obtained from trustworthy contemporaneous authority in all cases, and is believed to be essentially correct; but a reference to American paleontological literature will show several instances of the difficulties with which this unfortunate want of exactitude in the matter of dates has beset the path of the contemporary student.

NOTE.—The table of geological distribution rests in part on a similar table published by Mr. Davidson in the *Annales de la Soc. Malac. de Belgique*, t. x, 1875, though numerous changes and additions have been introduced and a different form of presentation preferred.

Names contained in bare lists and catalogues without definitions it has not been attempted to enumerate, except when the publication was of the nature of a nomenclator.

Etymologies have, for the most part, been intentionally ignored.

INDEX.

- Abrachiopoda**, Hermannsen. 1852.
Ind. Gen. Mal. Suppl. p. 1. (= *Abrachiopodes*, D'Orb.)
- Abrachiopodes**, D'Orbigny. 1847.
Comptes Rendus, xxv, p. 269. Division of Brach. cont. *Thecidæ*, *Caprinidæ*, *Radiolidæ*.
- Acambona**, White. *Spiriferidæ*. 1862.
Proc. Boston Soc. Nat. Hist. April, 1862, p. 27, f. 1-2. (Carb.) Type *A. prima*, White, l. c. (Cf. *Eumetria*, Hall.)
- Acanthothiris**, D'Orbigny. *Rhynchonellidæ*. 1850.
Ann. Sci. Nat. xiii, p. 323, and Pal. Franç. Terr. Cret. iv, p. 343. Type *Rhynchonella spinosa* (Schloth. sp. Verst. 1813). Dav. Mon. Oölit. Brach. p. 71, pl. xv, f. 15-20. (Oölitic.)
- Acanthothyris**, Paetel. *Rhynchonellidæ*. 1875.
Fam. u. Gatt. Moll. p. 1. (= *Acanthothiris*, D'Orb. corrig.)
- Acarde**, Latreille. *Rudistes*. 1825.
Fam. Nat. Règne An.* Gen. Rudistarum, male ad Brach. ref. (*Acardia*, Berth. *Radiolites*, Lam.).
- Acardia**, Berth. *Rudistes*. 1827.
Germ. Ed. Latreille Fam. Nat. p. 197. (Cf. *Acarde*, Latr.)
- Acardines**, Hermannsen. *Coelenterata*. 1846.
Ind. Gen. Mal. i, p. 3. (Cf. *Les Acardes*, Desm.)
- Acephalophora palliobranchia**, Blainville. 1814.
Prodr. Bull. Soc. Philom. p. 179. Order *Acephal.* cont. *Lingula*, *Terebratula*, *Orbicula*, *Hyalea*?, *Pneumodermon*?
- Acrites**, Davidson & King. *Obolidæ*. 1874.
Quart. Journ. Geol. Soc. Lond. May, 1874, p. 137, lapsus, = *Acritis*, Volborth, from *ακριτος*. (Ser. *Acritus*.)
- Acritis**, Volborth. *Obolidæ*. 1869.
Verh. K. Min. Ges. St. Petersburg für 1868, p. 217, t. xvii, f. 7-9. (Sil.) Type *A. antiquissima*, Vollb. l. c. = *Obolus ant.*, Eichwald, Urwelt, 1843, ii, p. 142, t. iv, f. 1 a-c. Id. Leth. Ross. 1859, p. 928, t. xxxvii, f. 5 a-d, = *Aulonotreta sculpta*, Kutorga, Verh. l. c. 1847, p. 282, t. vii, f. 11. Quenstedt, Petr. Deutschl. 1871, p. 671, (= *Aulonotreta*, K.).
- This name, founded on Kutorga's second type of *Aulonotreta*, should give way to that name. It appears very closely related to Hall's *Leptobolus*, 1871.

- Acrotreta**, Kutorga. *Siphonotreta*. 1848.
Verh. K. Min. Ges. St. Petersburg, für 1847, p. 260, 275, t. vii, f. 7 a-c.
First sp. *A. subconica*, Kut. l. c. (Sil.). Taken as type by Davidson, 1856,
p. 241, pl. xiv, f. 19-23.
- Actinoconchus**, M'Coy. *Spiriferidae*. 1844.
Carb. Foss. of Ireland, p. 149. Sole ex. cited, p. 150, pl. 21, f. 6, *A. paradorus*, M'Coy, l. c. Woodward, Man. p. 224, f. 134. (= *Athyris*, M'Coy; Davidson, 1856, not of 1853.)
- Adherentia**, Reeve. *Brachiopoda*. 1841.
Conch. Syst. i, p. 174. Tribe Brach. cont. *Orbicula*, *Crania*, *Thecidea*.
(Not *Adherentia*, De Haan, 1825.)
- Enigma**, Koch. *Conchifera*. 1845.
Mart. Chemn. Conchyl. Cab. b, Lief 56, Bd. vii. (Recent.) Type *Tellina enigmatica*, Chemn. l. c. Genus acephal. male ref. Pfeiffer, Zeitschrift für Mal. 1846, p. 175; ad Brach.
- Æquivalves**, Latreille. *Lyopomata*. 1825.
Fam. Nat. Règne An. Fam. Brach. cont. *Lingula*. (= *Æquivalvia*, Berth.)
- Æquivalvia**, Berth. *Lyopomata*. 1827.
Latreille, Fam. Nat. Germ. Ed. p. 208. Fam. prima, ordine Pedunculato, cont. *Lingula*. (Cf. *Æquivalves*.)
- Agulhasia**, King. *Terebratulidae*. 1871.
Ann. Mag. Nat. Hist. ser. iv, t. vii, Feb. p. 109, pl. xi, f. 1-8. (Recent.) Type *A. Davidsonii*, King, l. c. p. 111. (= *Terebratulina*, D'Orb.)
- Ambloptrema**, Rafinesque. (*Incertæ sedis*). 1831.
Mon. Riv. Shells Ohio, p. 8. No ex. cited; diagnosis insufficient.
- Amblyptrema**, Agassiz. 1847.
Nom. Zool. Index, p. 45. (= *Ambloptrema*, Raf. corrig.)
- Ambocoelia**, Hall. *Spiriferidae*. 1860.
13th Regent's Rep. p. 71. Type *Orthis umbonata*, Contr. Journ. Acad. Nat. Sci. Phil. viii, p. 264, t. xiv, f. 4, 1842. Hall, l. c. f. 1-6. (= *Martinia*, M'Coy.)
- Ambocoilia**, Quenstedt. 1871.
Petref. Deutschlands, ii, p. 714; lapsus. (= *Ambocoelia*, Hall.)
- Amphiclima**, Laube. *Strophomenidae*. 1865.
Fauna Schicht. St. Cassians, 2te Abth. p. 28, pl. xiii, f. 9 a-d. Type *Producta dubia*, Munster sp. (Beitr. iv, p. 68, t. vi, f. 24), l. c.
- Amphigenia**, Hall. *Pentameridae*. 1867.
Not. Pal. N. York, vol. iv, p. 103. (Mar.) Pal. N. York, iv, p. 374, 383, pl. 59. Type *Pentamerus elongatus*, Vanuxem, (Rep. 3d Distr. N. York, p. 132, 1842); Hall, l. c. (Devonian.)
- Anastrophia**, Hall. *Pentameridae*. 1867.
Not. Pal. N. York, vol. iv, p. 163. Extra copies, Mar. 1867, p. 19. Pal. N. York, vol. iv, p. 374. Type *Pentamerus Verneuli*, Hall, l. c. Name proposed for *Brachymerus*, Shaler (*g. v.*), preoccupied by Dej. in *Coeloptera*, 1834.

- Ancistrocrania**, Dall. *Craniidæ*. 1877.
Proposed for *Cranopsis*, Dall; preoccupied by A. Adams in *Gastropoda*, 1860.
- Ancylobrachia**, Gray. *Arthropomata*. 1848.
Ann. Mag. Nat. Hist. ii, p. 435. Ord. Brach. cont. fam. *Terebratulida*.
- Ancylobrachia**, King. *Arthropomata*. 1850.
Perm. Foss. p. 81. Ord. Brach. cont. fam. *Strigocephalidæ*, *Terebratulidæ*, *Rhynchonellidæ*, *Magasidæ*, *Thecidæ*, *Argioidæ*.
- Ancylobranchia**, Paetel. *Arthropomata*. 1875.
Fam. u. Gatt. Moll. p. 12; lapsus (= *Ancylobrachia*, Gray.)
- Ancylopoda**, Gray. *Brachiopoda*. 1848.
Subclass Brach. Ann. Mag. Nat. Hist. ii, p. 435, cont. ord. *Ancylobranchia*, *Cryptobrachia*.
- Ancylopoda** King. *Arthropomata*. 1850.
Perm. Foss. p. 81. Subclass Brach. cont. *Ancylobrachia*.
- Annelida**, Morse. *Invertebrata*. 1870.
Am. Journ. Sci. and Arts, vol. 1, p. 100, July. Class cont. (among other things) *Brachiopoda*.
- Anomia**, Linné. *Mollusca*. 1758.
Syst. Nat. ed. x, p. 701. First sp. *A. craniolaris*, Lin.
Syst. Nat. ed. xii, p. 1150, 1766. First sp. *A. craniolaris*, Lin.
Genus including *Brachiopoda* and *Acephala*, sp.
- Anomites**, Auctt. *Invertebrata*. 1766.
Gen. biv. fos. *Anomie* Lin. resp. auctt. xviiith cent.
- Anomites**, Schlotheim. *Invertebrata*. 1822.
Petref. p. 246. Gen. biv. fos. cont. *Craniolites*, *Hysterolites*, *Terebratulites*.
- Anoplothea**, Sandberger. *Atrypidæ*. 1856.
Sitzungsb. K. Akad. Wiss. Wien für 1855, pt. xvi, p. 5, xviii, p. 102-104. Pl. i, f. 1-6. Type *A. lamellosa*, Sandb. l. c. = *Ter. venusta*, Schnur; Meyer & Dunker, Paleont. iii, p. 180, pl. xxiv, f. 3. Davidson, 1856, p. 260, pl. xiv, f. 51-53.
- Anteletes**, D'Orbigny. *Arthropomata*. 1850.
Pal. Franç. Terr. Cret. iv, p. 348, in syn. (= *Eteletes*.)
- Antinomia**, Catullo. *Terebratulidæ*. 1850.
Quart. Journ. Geol. Soc. of London, vii, p. 74. Type *Terebratula diphya*, Col. sp., Davidson, 1856, pl. vi, f. 5. (= *Pygope*, Link.)
- Antirhynchonella**, Quenstedt. *Rhynchonellidæ*. 1871.
Petref. Deutschl. ii, p. 231, 727. † Subg. *Pentamerus*; first sp. *P. tenuistriatus*, Walmstedt sp., Eichwald, Leth. Ross. i, p. 789; second sp. *P. linguifer*, Murch. Sil. 21, 22.
- Apalosia**, Rafinesque. *Invertebrata*. 1815.
Analyse de la Nature, p. 136. Class equivalent to the *Mollusca* of Cuvier. (= *Mollusca*.)

- Apleccerotis**, Pætel. (Incertæ sedis.) 1875.
Fam. u. Gatt. Moll. p. 14; lapsus (= *Apleurotis*, Raf.).
- Apleurotis**, Rafinesque. (Incertæ sedis.) 1819.
Journ. de Phys. lxxxviii, p. 427. No species described. First of two names cited, *A. pectenoides*, Raf. l. c. Fos. Ohio. Ibid. En. Rem. Obj. Cab. Raf. 1831, p. 3, *A. pectinoides*, Raf. is described. (*Brachiopoda*?)
- Aplosia**, Agassiz. 1847.
Nom. Zool. Index, p. 84; lapsus (= *Apalosia*, Raf.)
- Apygia**, Bronn. *Brachiopoda*. 1862.
Klass. n. Ordn. Thierreichs, iii, 1ste Abth. p. 301. Ord. cont. *Brach. articulata*. (= *Arthropomata*.)
- Arbusculites**, Murray. 1831.
Edinburgh New Phil. Journ. xi, p. 148. Type *A. argentea*, Murr. l. c.
A fictitious genus of Zoophytes founded, according to Bronn, on the tubular spines of a species of *Productus*.
- Arbusculithes**, Paetel. 1875.
Fam. u. Gatt. Moll. p. 15. (= *Arbusculites* Murray.)
- Argiope**, Deslongchamps. *Terebratulidæ*. 1842.
Mém. Soc. Lin. de Normandie, vii, p. 9. (Recent.) Type *Anomia decollata*, Chemnitz, Conchyl. Cab. viii, p. 96, pl. 78, f. 705. Dav. 1853, p. 72. Davidson, 1856, pl. vii, f. 35-23. Name preoccupied by Savigny and Audouin for a genus of *Arachnida*, 1827. (= *Megathyris*, D'Orb.)
- Argiopidæ**, King. *Arthropomata*. 1850.
Perm. Foss. p. 81. Fam. Brach. cont. *Argiope*.
- Argiopina**, Gray. *Arthropomata*. 1853.
Brit. Mus. Cat. Brach. p. 15. Tribe Brach. cont. *Argiope*.
- Argyope**, Deslongchamps. *Terebratulidæ*. 1842.
Mém. Soc. Lin. de Normandie, vii, p. 9. Vernacular equivalent for *Argiope*, Desl. q v. (= *Megathyris*, D'Orb.)
- Arthropomata**, Owen. *Brachiopoda*. 1858.
Encyclop. Britannica, ed. viii, t. xv, art. Mollusca, p. 336. Ord. cont. *Brach. articulata*.
- Articulata**, Huxley. *Brachiopoda*. 1864.
Lect. on Classification. Intr. Class. An. p. 116. Order cont. *Brachiopoda articulata*. (= *Arthropomata*, Ow.)
- Athyridæ**, Phillips. *Brachiopoda*. 1841.
Pal. Foss. Cornwall and Devon. p. 54. Fam. Brach. cont. *Producta*, *Calceola*.
- Athyridoidæ**, Agassiz. *Brachiopoda*. 1847.
Nom. Zool. Index, p. 115. (= *Athyridæ*, Phill. corrig.)

Athyris, McCoy.*Spiriferidae*. 1844.

Carb. Foss. Ireland, pp. 128, 146, f. 19. Erroneous diagn. No type specified. First sp. p. 147, is *Ter. concentrica*, von Buch, Chenu, Man. ii, p. 216, f. 1108-10. Davidson, 1856, pl. ix, f. 23, 29, 30. Etym. *a*, without; *thuris*, a door or deltidium (not doorway or foramen). Syn. *Seminula*, McCoy, 1844; *Actinoconchus*, McCoy, 1844; *Spirigera*, D'Orbigny, 1847; *Euthyris*, Quenst. 1871; *Athyris*, Davidson, 1856, not 1853.

Athyris, Davidson.*Spiriferidae*. 1853.

Intr. p. 72, pl. vi, f. 71, 72. Type *Atrypa tumida*, Dalman, sp. Ter. p. 134, t. v, f. 3, 1828. Davidson, 1856, pl. ix, f. 33, 37. (= *Meristella*, Hall, not *Athyris*, McCoy.) Cf. *Meristella*, Hall, 1862.

Athyris, Davidson.*Spiriferidae*. 1856.

Intr. p. 166, pl. ix, f. 23, 29, 30. Type *A. concentrica*, von Buch, McCoy. (= *Athyris*, McCoy.)

Atremosia, Rafinesque.*Brachiopoda*. 1831.

Mon. Biv. Shells Ohio, p. 8. Fam. Brach. cont. gen. *Orbicula*, *Strophesia*, *Diclipites*, *Trunculites*, *Productus*, *Styrasis*, *Goniclis*, *Megarites*.

Atretia, Jeffreys.*Rhynchonellida*. 1876.

Proc. Roy. Soc. London, 1870, 121, p. 421, ¶ 36. Type *A. gnomon*, Jeffr. MS. No description of genus or species. Anu. Mag. Nat. Hist. Sept. 1876, p. 250. Genus and species fully described. Dav. Suppl. Brit. fos. Brach. 1874, p. 7, pl. i, f. 7-10. Syn. *Cryptopora*, Jeffr. (= *Dimerella*, Zittel, q. v.)

Atrypa, Dalman.*Atrypidae*. 1828.

Kongl. Vet. Acad. Handl. 1827, p. 102. First sp. p. 127, t. iv, f. 2. *Anomites reticularis*, Wahlenberg, Act. Upsal. viii, p. 65. Davidson, 1856, pl. ix, f. 39-46. (Cf. *Spirigera*, D'Orb.)

Atrypa, McCoy.*Atrypidae*. 1844.

Carb. Foss. Ireland, p. 150, f. 30. First sp. *Terebratula acuminata*, Sow-erby, Min. Conch. t. 324, 1823. Dav. 1856, t. x, f. 19.

Atrypidae, Dall.*Arthropomata*. 1877.

Fam. Brach. cont. *Atrypa*, *Anoplothea*, *Zygospira*, *Calospira*, *Koninckina*, and probably *Davidsonia*.

Well distinguished from *Spiriferidae* by the direction of the spires, which must have necessitated a wholly different arrangement of the internal organs. Indicated long since by D'Orbigny.

Aulacorhynchus, Dittmar.*Arthropomata*. 1871.

Verh. K. Min. Ges. St. Petersburg, 2te ser. vii, p. 1, t. 1, f. 1-13. (Carb.) Type *A. Packi*, Dittmar, l. c. pp. 2-4, &c.

A remarkable form of doubtful family relations, of which species have been referred to *Chonetes* and *Leptæna*.

Aulonotreta, Kutorga.*Obolidae*. 1848.

Verh. K. Min. Ges. St. Petersburg f. 1847, pp. 260, 278. Types *A. polita*, Kutorga, l. c. t. vii, f. 10, = *Obolus apollinis*, Eichw.; and *A. sculpta*, Kutorga, l. c. p. 282, t. vii, f. 11, = *Obolus antiquissima*, Eichw. Urwelt, 1843, ii, p. 142, t. iv, f. 1 a-c. Ib. Leth. Ross. 1859, p. 928, t. xxxvii, f. 5 a-d. (Sil.)

Genus proposed to replace *Obolus* (of which Kutorga's first sp. is the type) on the ground that the latter name is inapplicable. The second sp. of Kutorga has been separated by Volborth under the name of *Aeritis*, but, if distinct (which does not seem certain), should take Kutorga's name, as of prior date, instead of a new one.

Aulosteges, Helmersen.*Productidae*. 1847.

Jahrb. für Min. p. 330; Bull. Acad. Imp. Sci. St. Petersburg, vi, p. 135, t. vi, f. 12. Type *A. variabilis*, Helmers. l. c. = *A. Wangenheimi*, Verneil, teste Davidson, 1856, p. 222, pl. xii, f. 36-40.

Bicornes, Quenstedt.*Rhynchonellidae*. 1851.

Handb. Petref. p. 449; Petref. Deutschl. 1871, ii, pp. 34, 715. (= *Rhynchonella*, sp.)

Bilobites, Linné.*Strophomenidae*. 1775.

Syst. Nat. ed. Müller, vi, p. 325. *Auomia biloba*, Lin. Syst. Nat. ed. Gmel. p. 3345; Quenst. Petref. Deutschl. ii, 1871, p. 550; Atlas, t. 55, f. 61-72. Syn. *Dicellosia*, King.

Bohrmuschelsteine, Anett.

Voc. vulg. cent. xviii^{ma} = Brach. sp. foss.

Bouchardia, Davidson.*Terebratulidae*. 1849.

Bull. Soc. Géol. de France, vii, p. 62, pl. i, f. 1-6. Type *Terebratula tulipa*, Blainville, Diet. Sci. Nat. 53, p. 144, 1828, = *T. rosea*, Mawe, Reeve, Conch. Icon. pl. viii, f. 33. Syn. *Pachyrhynchus*, King, not Spix.

Brachidae, D'Orbigny.*Brachiopoda*. 1849.

Cours Élém. Pal. p. 80. Ord. Brach. cont. sect. *Brachides propres*, *Semi-brachides*.

Brachides propres, D'Orbigny.*Brachiopoda*. 1849.

Cours Élém. Pal. p. 80. Sect. Brach. cont. *Lingulidae*, *Calceolidae*, *Productidae*, *Orthisidae*, *Rhynchonellidae*, *Uncitidae*.

Brachionobranchia, Paetel.

1875.

Fam. n. Gatt. Moll. p. 25, as of Woodward. Class = *Brachiopoda*.

Brachionopoda, Agassiz.

1847.

Nom. Zool. Index, p. 145. (= *Brachiopoda*, Cuv. bene corrig.)

Brachiopea, Rafinesque.*Brachiopoda*. 1815.

Analyse de la Nature, p. 148. Fam. cont. *Orbicula*, *Terebratula*, *Lingula*. Ib. Fos. biv. Western Region, p. 7, 1831.

Brachiopía, Herrmannsen.

1852.

Index. Gen. Mal. Suppl. p. 18; lapsus (= *Brachiopca*, Raf.).

Brachiopoda, Cuvier.*Invertebrata.* **1802.**

Annales du Mus. i, 1802, p. 77, fide Quenstedt.

Diet. Sci. Nat. i, p. 134, 1805.

Roissy, Moll. vi, p. 460, 1805. Class cont. *Arthropomata* and *Lyopomata* of Owen.

Adt. Dumeril, 1806, Traite Élém.

Order.

Lamarck, 1809, Phil. Zool. p. 317.

Fam.

Cuvier, 1817, Règne Anim. ii, 358, 502.

Class.

Lamarck, 1819, Hist. An. s. Vert.

Fam.

Ferussac, 1819, Tabl. Syst. xxxviii.

Class.

Schweigger, 1820, Naturges. p. 689.

Order.

Latreille, 1825, Fam. Nat. Règne An.

Class.

Rang, 1829, Man. p. 257.

Order.

Fleming, 1828, Brit. An. p. 225.

Divis.

Menke, 1828, Syn. p. 56.

Class

Deshayes, 1830, Enc. Méth. ii, p. 140.

Sub-class.

Eichwald, 1831, Zool. Spec.

Order.

Geinitz, 1846, Grundr. Verst. p. 489.

Order.

Gray, 1848, Ann. Nat. Hist. p. 435.

Class.

Davidson, 1851-54, Intr. Brach. p. 41.

Class.

Brachiopodæ, Bronn.**1824.**

Syst. Urwelt Conch. p. 35, as of Lamarck.

Brachiopodes, Bellerm.**1814.**

Mag. Berliner Ges. Naturf. Freunde, vii, p. 88 (not seen).

Brachiopodes cirrides, D'Orbigny.**1849.**Cours Élém. Pal. p. 80. Ord. Brach. cont. *Thecidæ*, *Cuprinidæ*, *Radiolidæ*.**Brachiopodidæ, Broderip.****1839.**Penny Cyclop. xiv, art. Malacology, p. 320. (= *Brachiopoda*, Cuv.)**Brachipoda, Bronn.****1848.**Index Paleont. passim; lapsus (= *Brachiopoda*, Cuv.).**Brachymerus, Shaler.***Pentameridæ.* **1865.**Brach. Anticosti, Bull. Mus. Comp. Zool. i, p. 69. Type *Pentamerus Vernenili*, Hall, Pal. N. York, iii, pl. 48, f. 1, a, o, p, t, x, v. (Sil.) Nom. præoc. by Dej. Col. 1834. (= *Anastrophia*, Hall.)**Brachyopoda, Fic. u. Carus.****1826.**Ueber Ges. Thierr. * * Oken, Isis, 1828, p. 855. (*Brachiopoda*.)**Brachyprion, Shaler.***Strophomenidæ.* **1865.**Brach. Anticosti, Bull. Mus. Comp. Zool. i, p. 63 (June.). Type *Strophomena ledæ*, Billings, Lower Sil. Foss. p. 120, cnt, 1862.**Brachythyris, McCoy.***Spiriferidæ.* **1844.**Carb. Foss. Ireland, p. 128, f. 20. First sp. p. 144. *Spirifera duplicicosta*, Phillips, Geol. Yorks. ii, 218, pl. x, f. 1, 1836. (= *Spirifer*, Sow.)**Branchiopoda, Risso.****1826.**Hist. Nat. Europe MÉR. iv, p. 386. Not of Latreille, fam. Crustacorum. (= *Brachiopoda*, Cuv.)

- Bucardites**, Argenville. *Mollusca*. **1757**.
 Conchyl. p. 530. Non-binomial. Gen. cont. *Tridacna* sp. et *Terebratula* sp. fos.
- Bufocephalus**, Linné. *Brachiopoda*. **1779**.
 Vollst. Natursyst. Min. übersetz. von Gmel. iv, p. 49. Gen. Brach. costatæ, *Spiriferi* (sp.) teste Quenstedt, *Producti* (sp.) teste Schenckher.
- Bursula**, Klein. *Brachiopoda*. **1753**.
 Ostracol. p. 173, pl. xii, f. 80. Gen. Brach. dubinn. Blainville, Diet. Sci. Nat. v, Suppl. p. 139, ad *Terebratula*, Luid, ref. Sole ex. *B. corallina*, Klein, l. c. (non-binomial).
- Calceola**, Lamarek. *Coelenterata*. **1799**.
 Prodrome, p. 89. Sole ex. *Anomia sandalina*, Gmel. Syst. Nat. iv, p. 349. Davidson, 1856, pl. xiii, f. 9-13. (Sil.) Not = *Calceola*, Swains. 1840.
 This has been shown by Lindström to be a genus of operculated corals.
- Calceolaceæ**, Menke. *Invertebrata*. **1828**.
 Syn. Mus. Menkeanum, p. 56. Fam. = *Les Acardes*, Desm.
- Calceolacea**, Menke. *Invertebrata*. **1830**.
 Syn. Mus. Menkeanum, ed. ii^a, p. 95. Cf. præc.
- Calceolæ**, Desmoulins. *Coelenterata*. **1826**.
 Bull. Soc. Lin. de Bordeaux, i, p. 241. Fam. cont. *Calceola*.
- Calceolaria**, Griffith. *Calceolidæ*. **1834**.
 New Ed. Cuvier, An. Kingdom, xii, p. 92. (= *Calceola*, Lam.)
- Calceolidæ**, King. *Coelenterata*. **1846**.
 Ann. Mag. Nat. Hist. xviii, p. 28. Fam. cont. *Calceola*.
- Calceolina**, Agassiz. *Coelenterata*. **1847**.
 Nom. Zool. Index, p. 166. (= *Calceolidæ*, King, corrig. not = *Calceolina*, A. Adams, 1867.)
- Calceolites**, Schlotheim. *Calceolidæ*. **1820**.
 Petrefactenkunde, p. 173. (*Calceola*, Lam.)
- Camarella**, Billings. *Rhynchonellidæ*. **1859**.
 Canadian Nat. iv, Aug. p. 301. (Sil.) First sp. *C. Folborthi*, Bill. (l. c.), Rep. Progr. Canadian Geol. Surv. 1863, p. 143, f. 77 a-c. Second sp. *C. Panderi*, Bill. (l. c.), 1863, l. c., f. 76, a, b; not = *Triplexia*, Hall.
 Typical species Rhynchonelloid; some of the others said to be Pentameroid.
- Camarium**, Hall. *Spiriferidæ*. **1859**.
 12th Regent's Rep. Oct. p. 42-43, f. 1-6. *C. typum*, Hall, l. c. (Lower Held.) (= *Merista*, Suess.)
- Camarophoria**, Bronn. *Pentameridæ*. **1845**.
 Leonh. u. Bronn, Jahrb. 1845, p. 254. (= *Camerophoria*, King cor.)

- Camerella**, "Billings", Paetel. *Rhynchonellidae*. 1875.
Fam. u. Gatt. Moll. p. 32; lapsus (= *Camarella*, Bill.).
- Camerothoria**, King. *Rhynchonellidae*. 1846.
Ann. Mag. Nat. Hist. xiv, 1844, p. 313. No description or ex. cited.
Ibid. xviii, 1846, p. 89. Type *Terebratulula Schlotheimi*, von Buch, cf. Chenu, Man. ii, p. 220, f. 1132. (Cf. *Stenocisma*, Conr.)
- Capsularia**, Llhwyd. *Brachiopoda*. 1699.
Lith. Brit. Ichn. p. 466. Non-binomial. (Cf. *Delthyris*, Dalm.)
- Centronella**, Billings. *Terebratulidae*. 1859.
Canadian Nat. iv, April, p. 131, f. 1-5. (Dev.) *Rhynchonella glansfagea*, Hall. Cf. Hall, Am. Journ. Sci. Arts, xxxv, pp. 403, 405, f. 22; p. 400, f. 1-5, et Bill. l. c. xxxvi, p. 237, f. 8. Syn. *Cryptonella*, Hall, pars. (Cf. *Lepto-coelia*, Hall, 1859.)
- Charionella**, Billings. *Spiriferidae*. 1861.
Can. Journ. Nat. Hist. May, 1861 (extras, Mar. 1861), p. 148. Sole ex. *Atrypa scitula*, Bill. (not Hall), p. 273, f. 100, 101. Ib. ex. *Ch. circe*, Bill. l. c. p. 273. (Dev.) Subg. *Athyris*. (Cf. *Meristella*, Hall, 1861.)
- Chelodes**, Davidson and King. (*Incertæ sedis*.) 1874.
Quart. Journ. Geol. Soc. London (May), p. 167, pl. xviii, f. 14, a-c. Type *C. Bergmani*, D. & K. l. c. (Sil.) No gen. diagn.
Possibly a coral. Looks like the internal fulcrum of *Zirphæa* (*Leuconyx*, H. Adams!).
- Chonetes**, Fischer de Waldheim. *Productidae*. 1837.
Oryct. Gouvern. Moscou, part ii, p. 134, pl. 26, f. 8-9. Sole ex. *Orthis striatella*, Fisch. l. c. as of Dalman, = *Leptæna* seu *Producta variolata*, D'Orbigny, Voy. Am. Mérid. Pal. p. 49, pl. iv, f. 10, 11, 1842, = *Chonetes variolata*, Kon. Mon. *Chonetes*, p. 206, pl. xix, f. 5, xx, f. 2, a-l, 1847. (Sil.)
- Chonetidae**, Bronn. *Arthropomata*. 1862.
Klass. u. Ordn. Thier. ; Malacozoa, 3ten Bd., 1ste Abth. p. 301-2. Fam. Brach. cont. *Chonetes*, *Strophalosia*, *Orthothrix*, *Aulosteges*.
- Chonetus**, Paetel. *Productidae*. 1875.
Fam. u. Gatt. Moll. p. 42; lapsus (= *Chonetes*, Fisch.).
- Choniopora**, Schauroth. *Craniidae*. 1854.
Zeitschr. Deutsch. Geol. Ges. vi, p. 546. Type = *Crania Schanrothi*, Geinitz, Dias, t. 20, f. 3, 1861. Quenstedt, Petref. Deutschl. 1871, p. 687, pl. 61, f. 90.
Genus described as a polyzoon, being covered with minute, short tubulæ, but may be a good section of *Crania*.
- Choristides**, Kieferstein. *Brachiopoda*. 1829.
Zeit. Geogn. p. 43; lapsus (= *Choristites*, Fischer).
- Choristites**, Fischer de Waldheim. *Spiriferidae*. 1825.
Sur la Choristite, p. 7, pl. 1, f. 1-4. First sp. *C. mosquensis*, Fisch. l. c. = *Spirifer m.*, Murch. Vern. u. Keys. Geol. Russ. ii, p. 161, pl. v, f. 2. Davidson, 1856, pl. viii, f. 26. Fisch. Oryct. Gouv. Moscou, 1830, t. 24, f. 1-4, *C. mosquensis* F. (= *Spirifer*, Sow.) Quenstedt, Petref. Deutschl. 1871, ii, pp. 27, 467, 506; atlas, pl. 53, f. 58-59, gen. *Delthyridarum*.

- Cincta**, Quenstedt. *Terebratulidae*. 1871.
 Petref. Deutschl. ii, p. 27; atlas, t. 45, f. 93-121; gen. Epithyridarum.
 Type *Terebratula numismalis*, Lamarek, Hist. vi, p. 249, 1819. (= *Eudesia*, King.)
- Cistella**, Gray. *Terebratulidae*. 1853.
 Brit. Mus. Cat. Brach. (Jan.) p. 114. Type *Terebratula cuneata*, Risso, Hist. Nat. Eur. Mérid. f. 179, 1826. Dall, Rev. Terebr. 1870, p. 146, f. 24. (Rec.) Syn. *Zellania*, Moore.
- Cleidothyris**, Paetel. *Brachiopoda*. 1875.
 Fam. n. Gatt. Moll. p. 45; lapsus (= *Cleiothyris*, Phillips).
- Cleiothyris**, Phillips. *Atrypidae*. 1841.
 Pal. Foss. Cornwall and Devon, p. 55. Cf. Brit. Pal. Foss. Cambridge Mns. p. 196, 1852. Suggested to replace *Atrypa*, Dalman, on account of objections to the latter name, but not used in the text. (= *Atrypa*, Dalman.)
- Cleiothyris**, King. *Spiriferidae*. 1850.
 Ann. Mag. Nat. Hist. xviii, p. 32 (referred to *Atrypa*), 1846. Ibid. Perm. Foss. p. 138, pl. x, f. 1-10. Type *Terebratula pectinifera*, King, l. c. = *Atrypa pectinifera*, J. de C. Sow. Min. Conch. vii, p. 14, pl. 616, 1841. Not *Cleiothyris*, Phillips. (= *Athyris*, McCoy.)
- Cleiothyris**, Agassiz. *Atrypidae*. 1847.
 Nom. Zool. Index, p. 259. (= *Cleiothyris*, Phil. corrig.)
- Clipsilia**, Rafinesque. (*Incertæ sedis*.) 1820.
 Ann. Gen. Sci. Phys. Bruxelles, v, p. 232. Name only; no description or type cited. Gen. incert.
- Clistenterata**, King. *Brachiopoda*. 1873.
 Ann. Mag. Nat. Hist. ser. iv, vol. xii, p. 15, July. Subclass cont. Brach. articulata. (= *Arthropomata*, Owen.)
- Clitambonites**, Agassiz. *Brachiopoda*. 1847.
 Nom. Zool. Index, p. 259. (= *Klitambonites*, Pander corr.)
- Coclospira**, Hall. *Atrypidae*. 1863.
 16th Regent's Rep. July, p. 60, ent. Type *Leptocoelia concava*, Hall. 10th Regent's Rep. 1857, p. 107. Hall's first species of *Leptocoelia*, but not congeneric with the species finally selected by Hall as typical of the latter. Cf. Am. Journ. Sci. and Arts, xxxvi, p. 16, f. 37, July, 1863. Same type. Not = *Leptocoelia*, Hall, 1859. (Comp. *Zygospira*, Hall.)
- Comerophoria**, Gray. *Pentameridae*. 1848.
 Ann. Mag. Nat. Hist. ii, p. 438; lapsus (= *Camerophoria*, King).
- Concha anomia**, Colonna. *Brachiopoda*. 1616.
 Fab. Col. De Purpura, p. 23. Aquat. Obs. p. 43. Non-binomial. Indeterminate species of recent and fossil arthropomatous brachiopods.
- Concha triangulata vulgaris**, Gualteri. *Brachiopoda*. 1742.
 Index, tab. 82. Non-binomial. (= *Terebratula*, Lillwyd.)

- Concha triloba**, Klein. *Brachiopoda*. **1753**.
Ostracol. p. 172, t. xi, f. 75. Non-binomial. First species, *Striata prima*, *ravior*, *columnae*; Kl. l. c. p. 172. (*Incert.*)
- Conchidium**, Linné. *Pentameridae*. **1760**.
Mus. Tessin. p. 90, t. v, f. 8, 1753. *C. bilocularis*, Lin. l. c. Ibid. Syst. Nat. ed. xi, ii, p. 163, 1760; diagn. in extenso, sole ex. *Pat. ? bilocularis*, Lin. = *Anomites bilocularis*, Wahl. Acta Upsala, 1821, viii, p. 67, = *Gypidia conchidium*, Dalm. Quenst. Petref. Deutschl. ii, p. 227, 1871; atlas, pl. 43, f. 36-9. Syn. *Gypidia*, Dalman, Hall.
- Conchites**, Linné. *Brachiopoda*. **1753**.
Mus. Tessin. p. 83, t. v, f. 1-8. Indeterminate fossil Brachiopoda.
- Conchylolithus**, Martin. *Brachiopoda*. **1809**.
Petref. Derb.* teste Agassiz. (Cf. *Conchites*.)
- Conradia**, Hall, MS. *Trimerellidae*.
Cf. Dav. & King. Quart. Journ. Geol. Soc. London, 1874, p. 159. Not *Conradia*, A. Ad. (= *Dinobolus*, Hall.)
- Crania**, Retzius. *Craniidae*. **1781**.
Schrift. Berliner Ges. Naturf. Freunde, ii, p. 72. Type *Anomia cranialis*, Lin. Syst. Nat. ed. xii, i, pt. 1, p. 1150, = *C. brattensburgensis*, Retz. l. c. Davidson, 1853, pl. ix, f. 229. Syn. *Orbicula*, Cuv.
- Craniacea**, Menke. *Brachiopoda*. **1830**.
Syn. Mus. Menkeanum, ed. ii, p. 96. Fam. Brach. cont. *Thecidia*, *Crania*, *Orbicula*. (= *Les Crannies*, Rang.) Ibid. Anton, Verzeichn. 1839, p. xii.
- Craniaceæ**, Menke. *Brachiopoda*. **1828**.
Syn. ed. i, p. 56. (olim). (= *Craniacea*, Mke.)
- Craniadæ**, Forbes. *Lyopomata*. **1838**.
Mal. Monensis, p. 32. Fam. Brach. cont. *Crania*, *Discina*?
- Craniadæ**, King. *Lyopomata*. **1850**.
Perm. Foss. p. 81. Fam. Brach. cont. *Crania*, *Siphonotreta*, *Criopus*.
- Craniadæ**, Gray. *Lyopomata*. **1840**.
Synopsis. Brit. Mus. i, p. 155. Fam. Brach. cont. *Crania*. Id. Ann. N. Hist. ii, p. 433, 1848. (= *Craniidae*.)
- Cranie**, Deshayes. *Invertebrata*. **1830**.
Encycl. Méth. iii, p. 533, table. Fam. Brach. cont. *Calceola*, *Crania*.
- Craniadées**, Davidson. *Lyopomata*. **1856**.
Intr. Ed. Deslongchamps, p. 226. Fam. Brach. cont. *Crania*.
- Cranicella**, Rafinesque. (*Incertæ sedis.*) **1815**.
Analyse de la Nature, p. 148. Name only; no type cited or diagnosis given. (? = *Crania*, Retz.)
- Cranidæ**, D'Orbigny. *Lyopomata*. **1849**.
Cours Élém. Pal. p. 90. Fam. Brach. cont. *Crania*.

- Cranidées**, D'Orbigny. *Lyopomata*. 1847.
Comptes Rendus, xxv, p. 269. Fam. Brach. cont. *Crania*.
- Craniidæ**, King. *Lyopomata*. 1846.
Ann. Mag. Nat. Hist. xviii, p. 23. Fam. Brach. cont. *Crania*, *Siphonotreta*.
- Craniidæ**, H. and A. Adams. *Lyopomata*. 1858.
Gen. Rec. Moll. ii, p. 583. Fam. Brach. cont. *Crania*.
- Craniolites**, Schlotheim. *Lyopomata*. 1820.
Petrefactenkunde, p. 247. A general term for the fossil sp. of *Crania*.
- Craniolithes**, Auctt. *Lyopomata*.
Cf. *Craniolites*.
- Craniops**, Hall. *Craniidæ*. 1859.
12th Regent's Rep. p. 84 in catalogue. No diagnosis; inserted as a corrected name for *Orbicula* (?) *squamiformis*, Hall, Geol. Rep. 1843, p. 108, f. 1; Pal. N. Y. ii, p. 250, t. 53, f. 4 a-b. (Sil.) Hall, Pal. N. Y. iv, p. 413, 1867 (advance copies only; omitted in the published volume). Davidson, Annales Soc. Mal. Belgique, x, 1874, table, No. 107. (= *Pholidops*, Hall.) Not *Cranopsis*, Dall. Comp. *Pseudocrania*, McCoy.
Pholidops was substituted for this name with the same type and a full description in the 13th Rep. p. 92.
- Craniscus**, Dall. *Craniidæ*. 1871.
Pall. Mus. Comp. Zool. iii, No. i, p. 27. Type *Crania tripartita*, Munster sp. Davidson, 1856, pl. xiii, f. 21.
- Cranopsis**, Dall. *Craniidæ*. 1871.
Bull. Mus. Comp. Zool. iii, pt. 1, p. 26-7. Type *Crania parisiensis*, De-france sp. Davidson, 1856, pl. xiii, f. 23 a-b. (= *Aucistrocrania*, Dall.) Not *Cranopsis*, A. Ad. 1867, gen. gast.
- Crepidites**, Schroter. *Calceolidæ*. 1780.
Lith. Lex. i, p. 366. Non-binomial. (= *Crepites*, Hupsch.)
- Crepidolite**, Rozier. *Calceolidæ*. 1774.
Journ. de Phys. iii, p. 150. Non-binomial. Cf. *Calceola*.
- Crepidolithus**, Hupsch. *Calceolidæ*. 1768.
Nene Entdeck. pp. 40, 56. Non-binomial. Cf. *Calceola*.
- Crepite**, Rozier. *Calceolidæ*. 1774.
Journ. de Phys. iii, p. 150. Non-binomial. Cf. *Calceola*.
- Crepites**, Hupsch. *Calceolidæ*. 1768.
Nene Entdeck. pp. 40, 56. Non-binomial. Cf. *Calceola*.
- Criopiderma**, Poli. *Craniidæ*. 1795.
Test. utriusq. Sicil. ii, passim; lapsus (= *Criopoderma*, Poli).
- Criopoderma**, Poli. *Craniidæ*. 1795.
Test. utriusq. Sicil. ii, pp. 189, 255, 261. Non-binomial. Sole ex. *C. turbinatum*, Poli, l. c. Cf. *Criopus*, Poli. (= *Crania*, Retz.)

- Criopodes**, Herrmannsen. 1852.
Ind. Gen. Mal. Suppl. p. 38, pro *Kriopen*, Oken, q. v.
- Criopododerma**, Agassiz. *Craniidæ*. 1846.
Nom. Zool. Fasc. ix, p. 301, index. (= *Criopoderma*, Poli corrig.)
- Criopus**, Gray. *Craniidæ*. 1821.
London Med. Repository, p. 238. Fleming, Phil. Zool. ii, p. 499, 1822.
Type *Patella anomala*, Mull. Gray in Leach, Moll. Gt. Brit. 1852, p. 358, pl. xiii, f. 6. Sole ex. *C. orcadensis*, Leach, MS. = *Crania anomala*, Mull. sp. (= *Crania*, Retz.)
- Criopus**, Poli. *Brachiopoda*. 1791.
Test. utriusq. Sicil. i, p. 34. Non-binomial. Ex. *C. fimbriatus*, Poli, l. c. = animal of various brachiopods.
- Cryopus**, Deshayes. *Brachiopoda*. 1836.
An. s. Vert. ed. ii, vol. vii, p. 314, passim. (= *Criopus*, Poli.)
- Cryptacanthia**, White and St. John. *Terebratulidæ*. 1868.
Trans. Chicago Acad. Sci. i, p. 119, f. 3, a-c. Type *Waldheimia compacta*, W. & St. J. l. c. (Dev.) (? = *Eudesia*, King.)
- Cryptobrachia**, Gray. *Brachiopoda*. 1848.
Ann. Mag. Nat. Hist. ii, p. 435. Ord. Brach. cont. fam. *Thecidwada*.
- Cryptobranchia**, Paetel. *Brachiopoda*. 1875.
Fam. u. Gatt. Moll. p. 58; lapsus (= *Cryptobrachia*, Gray).
- Cryptocella**, Paetel. *Brachiopoda*. 1875.
Fam. u. Gatt. Moll. p. 59, as of Hall; ? lapsus (= *Cryptonella*, Hall).
Not *Cryptocella*, H. & A. Ad. 1854.
- Cryptonella**, Hall. *Terebratulidæ*. 1861.
14th Regent's Rep. p. 101-2. No type selected. First species mentioned p. 101, *Terebratula Lincklæni*, Hall. 13th Reg. Rep., p. 88. 15th Reg. Rep. p. 160, pl. iii, f. 6, 7; figures *C. eximia*, Hall, n. s. (Extra copies, descr. &c. p. 132-3.)
- Cryptonella**, Hall. *Terebratulidæ*. 1863.
16th Regent's Rep. pp. 41, 43-47. *C. Julia*, Winchell, cited as example. *C. Lincklæni*, Hall, remanded to *Terebratula*, and the genus acknowledged to be a synonym of *Centronella*, Billings. (See note, p. 47, l. c.)
- Cryptonella**, Hall. *Terebratulidæ*. 1867.
Notice of Pal. N. York, vol. iv, Mar. 1867, p. 20. *C. rectirostra*, Hall, the second species of the 14th Reg. Rep. taken as type. As last constituted, the group seems a valid section of *Waldheimia*. (Dev.)
- Cryptonema**, (Hall?) Bigsby. *Arthropomata*. 1868.
Bigsby, Thes. Sil. p. 93; name only in list. Sole ex. cited *C. siluriana*, Hall (? lapsus, = *Cryptonella*).
- Cryptopora**, Jeffreys. *Rhynchonellidæ*. 1869.
Nature, p. 136, Dec. 2, 1869. Ex. *C. gnomon*, Jeffr. No description of type or genus (cf. *Atrertia*, Jeffr.).

Ctenites, Kentman.*Invertebrata*. **1565.**

Nom. rer. foss. p. 33; and other non-binomial writers.

Name for longitudinally striate bivalves, among which some brachiopods were counted.

Cunolites, Auctt.

Cf. Defrance, Dict. Sci. Nat. xxii, 1821, p. 402, in synonymy. (Cf. *Hysteroolithus*.)

Curvulites, Rafinesque.*(Incertæ sedis.)* **1831.**

En. Rem. Obj. Cab. Raf. p. 4. Sole ex. *C. striata*, Raf. Not identifiable. Genus ref. by Agassiz, Nom. Zool. fasc. ix, p. 26, 1846, to the Brachiopoda.

Cyclothyridæ, Phillips.*Arthropomata*. **1841.**

Pal. Foss. Cornwall and Devon. p. 55. Fam. Brach. cont. *Epithyris*, *Hypothyris*.

Cyclothyrides, Agassiz.*Arthropomata*. **1847.**

Nom. Zool. Index, p. 519, = *Cyclothyridæ*, Phil. corrig.

Cyclothyris, McCoy.*(Incertæ sedis.)* **1844.**

Carb. Foss. Ireland, p. 150, f. 29. No ex. cited; a generic figure given. Undeterminable.

Cyclothyris, Davidson.*Rhynchonellidæ*. **1856.**

Intr. p. 181, as of McCoy; in synonymy. Type cited, *Rhynchonella latissima*, Sow. Min. Conch. ii, p. 37, t. 18, f. 1. (? = *Rhynchonella*.)

Cyrtana, Hall.*Spiriferidæ*. **1867.**

Pal. N. Y. iv, p. 188, err. typ. ? = *Cyrtina*, Davidson.

Cyrthia, D'Orbigny.*Spiriferidæ*. **1847.**

Comptes Rendus, xxv, p. 268, male pro *Cyrtia*, Dalm.

Cyrtia, Dalman.*Spiriferidæ*. **1828.**

Kongl. Vet. Acad. Handl. f. 1827, pp. 93, 97. First sp. *C. exporrecta*, Dalm. l. c. p. 118, t. 3, f. 1, = *Auomites exporrectus*, Wahl. Act. Upsal. viii, p. 64. (Sil.) Second sp. (var. of last, teste Dav.) *C. trapezoidalis*, Dalm. l. c. p. 119, t. 3, f. 2. Davidson, 1856, pl. viii, f. 33. The first name is assigned to the type by Dav. 1856.

Cyrtina, Davidson.*Spiriferidæ*. **1858.**

Brit. Carb. Brach. p. 66. First sp. *Cyrtia heteroclita*, Defrance, Dav. l. c. p. 67, cut. Chenut, Man. ii, p. 215, f. 1101, 1103. Dav. 1856, pl. viii, f. 36-39. Ibid. Dev. Brach. p. 48, pl. ix, f. 1-16.

Daphnoidia, Hibbert.*Articulata*. **1836.**

Trans. Roy. Soc. Edinb. xiii, p. 180. No specific name applied; a genus of Entomo-traca wrongly referred to the Brachiopoda by Agassiz, Nom. Zool. fasc. ix, p. 29, 1846.

Davidsonia, Bouchard-Chanteroux.*Atrypidæ*. **1849.**

Ann. Sci. Nat. c. xii, p. 84. Type *D. verneuii*, B.-C. l. c. Davidson, 1856, p. 207, pl. xiii, f. 2, 3, 6, 7.

- Davidsoniæ**, King. *Arthropomata*. 1850.
Perm. Foss. p. 81. Fam. Brach. cont. *Davidsonia*. Davidson, 1853, p. 51. (Mel. *Davidsoniæ*.)
- Delthiridæ**, Gray. *Terebratulidæ*. 1848.
Ann. Mag. Nat. Hist. ii. p. 438; lapsus (= *Deltayridæ*, McCoy).
- Delthyridæ**, Phillips. *Arthropomata*. 1841.
Pal. Foss. Cornwall and Devon. p. 54. Fam. Brach. cont. *Orthis*, *Spirifer*, *Strigiocephalus*, *Pentamerus*, *Cleiothyris*.
- Delthyridæ**, Quenstedt. *Arthropomata*. 1871.
Petref. Deutschl. ii, p. 27. *Mesopygia*, sect. ii, cont. subsect. a and b.
a. *Spirifer*. b. *Spiriferina*.
Choristites. *Syringothyris*.
Cyrtia. *Cyrtina*.
Trigonotreta. *Suessia*.
- Delthyridacea**, F. Braun. *Arthropomata*. 1840.
Verz. Bayr. Petref. p. 44. Fam. Brach. cont. *Spirifer*, *Orthis*.
- Delthyridea**, McCoy. *Arthropomata*. 1844.
Carb. Foss. Ireland, p. 130, f. 27. No ex. cited, but an unrecognizable generic figure given. (*Genus incert.*)
- Delthyridea**, King. *Terebratulidæ*. 1850.
Perm. Foss. p. 141. Type *Terebratula pectiniformis*, Schlottheim, Quenst. Handb. Petref. p. 463, t. 37, f. 14. (= *Trigonosemus*, Kön.)
- Delthyris**, Dalman. *Spiriferidæ*. 1828.
Kongl. Vet. Acad. Handl. f. 1827, pp. 93, 99. First sp. l. c. p. 120, t. iii, f. 3, *D. elevata*, Dalm. a Silurian sp. of *Spirifer*, teste. Dav. Not *Delthyris* Mke. or von Buch. (= *Spirifer*, Sow.)
- Delthyris**, Menke. *Terebratulidæ*. 1830.
Syn. Mus. Menkeanum, ed. ii. p. 96, as of Dalman, but types not congeneric. 1st spec. *Terebratella dorsata*, Lam. sp. Rve. Conch. Icon. v, f. 21 a-d. Not *Delthyris*, Dalm. (= *Terebratella*, D'Orb.)
- Delthyris**, von Buch. *Arthropomata*. 1837.
Ueber *Delthyris*, p. 4. Genus a medley of forms belonging to various groups. Not *Delthyris*, Dalm.
- Deltyrydæa**, Davidson. *Terebratulidæ*. 1856.
Intr. in synonymy of *Trigonosemus*, p. 126; lapsus (= *Delthyridæ*, McCoy).
- Dicellomus**, Hall. *Lyopomata*. 1871.
23d Regent's Rep. p. 246, pl. 13, f. 6-9, 1873. (Extras Mar. 1871, fide Hall.) Types *D. crassa*, Hall, l. c. = *Obolella* sp. Bill. and *Obolella?* *polita*, Hall, 16th Reg. Rep. p. 133, pl. vi, f. 17-21. Jan. 1864. (Cf. *Schmidlia*, Volb. 1869.)
- Diclipites**, Rafinesque. (*Incertæ sedis*). 1831.
Mon. Biv. Shells Ohio, p. 8. No ex. cited. *Gen. incert.*

Diclisma, Rafinesque. (*Incertæ sedis.*) **1821.**

Ann. Sci. Phys. Bruxelles, 1820, p. 232; name cited without any description in Mon. Turbinolies de Kentucky. Id. Mon. Biv. Shells Ohio, 1831, p. 7. No ex. cited. *Genus incert.*

Dicoelosia, King. *Strophomenida.* **1850.**

Mon. Perm. Foss. p. 106. (Sil.) Type *Anomia biloba*, Lin. Dav. 1853, t. viii, f. 143-5, sect. *Orthis*. (= *Bilobites*, Linné.)

Diconcha inaequalis, Klein. *Invertebrata.* **1753.**

Ostracol. p. 171. Non-binomial. Section containing genera, *Terebratula*, *Concha triloba*, *Concha adunca*, *Bursula*, *Globus*, *Stola*, *Concha ansata*.

Diceraniscus, Meek. *Rhynchonellida.* **1872.**

Am. Journ. Sci. and Arts., 3d ser. iv, p. 28. Type *D. ortonii*, Meek, l. c. Pal. Ohio, 1873, i, p. 176, pl. xv, f. 1 a-k. (= *Triplexia*, Hall.)

Dictyonella, Hall, MS. ? *Rhynchonellida.*

20th Regent's Report, p. 274, Mar. 1867. (Sil.) Type *Atrypa coralifera*, Hall, Pal. N. York, 1852, p. 281. (= *Eichwaldia*, Bill.)

Dielasma, King. *Terebratulida.* **1859.**

Proc. Dublin Un. Bot. Zool. Assoc. i, p. 260. Type *Terebratula elongata*, Schlotheim. Dav. Perm. Brach. p. 7, f. 5, 17, 18, 20. (= *Epithyris*, King, not Phillips. Cf. *Seminula*, McCoy, 1855, not 1844.)

Dignomia, Hall. *Lingulida.* **1871.**

23d Regent's Rep., p. 245, pl. 13, f. 3, 1873. Extras Mar. 1871, fide Hall. Type *D. alveata*, Hall, l. c.

Dimerella, Zittel. *Rhynchonellida.* **1870.**

Dunker & von Meyer, Paleont. p. 220. Type *D. Gumbelli*, Zittel, l. c. p. 222, pl. xli, f. 27-30. Syn. *Atretia*, Jeffr. *Cryptopora*, Jeffr.

Dinobolus, Hall. *Trimerellida.* **1871.**

23d Regent's Rep. p. 247, 1873. Extras, Mar. 1871, fide Hall. Type *Otolus Couradi*, Hall, 20th Reg. Rep. p. 368. (Compare *Aeritis*, Volborth, 1869.) Adt. Dav. & King, Quart. Journ. Geol. Soc. London, May, 1874, p. 159, pl. xviii, f. 1-4. (Cf. *Obolellina*, Bill.)

Diphyites, Schroter. (*Incertæ sedis.*) **1779.**

Lith. Lex. ii, p. 423. Non-binomial. (? = *Pygope*, Link.)

Diplothyridæ, Quenstedt. *Arthropomata.* **1871.**

Petref. Deutschl. ii, p. 27. Subsect. *Productida* cont. *Orthis*, *Orthisina*, *Leptana*, *Strophomena*, *Streptorhynchus*, *Hysteroolithus*, *Dicoelosia*, *Leptocoelia*. (*Diplothyra*, Tryon, = gen. *Pholadacea*.)

Discina, Lamarck. *Discinida.* **1819.**

Hist. An. s. Vert. vi, p. 236. Type *D. ostreoides*, Lam. (not described), = *Orbicula norvegica*, Sow. non. Lam. = *Crania striata*, Schum. + *C. radiata*, Gould, Moll. U. S. Expl. Exped. p. 465, f. 480, a-c, 1852. (Recent.)

Discina, Dall. *Discinida.* **1871.**

Bull. Mus. Comp. Zool. iii, p. 39, 1871. Subg. *Discina*, type *D. striata*, Schum. sp. (= *Discina*, Lam. sens. str.)

- Discina**, Turton. *Craniidae*. 1822.
Dithyra Brit. p. 238, ex parte. (= *Crania* sp.)
- Discinella**, Hall. (*Incertæ sedis*). 1871.
23d Regent's Rep. p. 246, 1873. Extras Mar. 1871, fide Hall. Diagnosis only; no ex. cited. *Gen. incert.* Said to = operculum of *Hyolithes* (*Pteropoda*).
- Discinidæ**, Gray. *Lyopomata*. 1840.
Synopsis. Brit. Mus. i, p. 155. Ann. Mag. Nat. Hist. ii, p. 439. Fam. Brach. cont. *Discina*.
- Discinidæ**, King. *Lyopomata*. 1850.
Perm. Foss. p. 81. Fam. Brach. cont. *Discina*, *Orbiculoidæ*, *Trematis*.
- Discinidæ**, Davidson. *Lyopomata*. 1853.
Intr. p. 51. Fam. Brach. cont. *Discina* (? *Orbiculoidæ*, *Trematis*), *Siphonotreta* (? *Acrotreta*). Ibid. 1856, p. 90.
- Discinina**, Agassiz. *Lyopomata*. 1847.
Nom. Zool. Index, p. 366. (= *Discinidæ*, Gray corrig.)
- Discinisca**, Dall. *Discinidæ*. 1871.
Bull. Mus. Comp. Zool. iii, p. 37, May, 1871. Type *Discina lamellosa*, Broderip, Reeve, Conch. Icon. pl. i, f. 4, 1862. (= *Discina*, auct. not Lam.)
- Eatonia**, Hall. *Rhynchonellidæ*. 1857.
10th Regent's Rep. p. 90, f. 1-7. No diagnosis. First sp. *Atrypa medialis*, Vanuxem, Pal. N. York, iii, t. 37, f. 1. (L. Held.) Ibid. 12th Regent's Rep. Oct. 1859, p. 35, f. 1-7, 1st. sp. *E. peculiaris*, Conr. 1841. Not *Eatonia*, Edgar Smith, gen. Gasterop. 1875.
- Eichwaldia**, Billings. (?) *Rhynchonellidæ*. 1858.
Rep. Prog. Canadian Geol. Surv. p. 190. (L. Sil.) Type, p. 192, f. 24 a-c, l. c. *E. subtrigonalis*, Bill. Hall, 20th. Reg. Rep. p. 274. (Relations doubtful.) Syn. *Dictyonella*, Hall.
- Elonia**, Meek & Hayden. *Rhynchonellidæ*. 1864.
Pal. Upper Missouri (Jurassic), p. 70, September; lapsus, pro *Eatonia*. (= *Eatonia*, Hall.)
- Enteleles**, Fischer de Waldheim. *Arthropomata*. 1830.
Oryct. Gouv. Moscou, 1830, p. 193, t. 26, f. 6-7. Ex. *E. glabra*, Fisch. l. c. Ibid. Bull. Soc. Imp. Nat. Moscou, 1843, p. 16. Ex. *E. Phillipsi*, Fisch. (*Gen. incert.*, probably = *Spirifer*, Sby.)
- Entellites**, G. B. Sowerby. *Arthropomata*. 1842.
Conch. Man. ed. ii, p. 144; lapsus (= *Enteleles*, Fisch.). Said by Sowerby to be a heterogeneous assembly.
- Entogyrae**, Dalman. *Arthropomata*. 1828.
Kongl. Vet. Acad. Handl. f. 1827, p. 89. Sect. Brach. cont. *Delthyris*, *Cyrtia*, *Atrypa*.
- Epithyridæ**, Morris. *Arthropomata*. 1846.
Quart. Journ. Geol. Soc. Lond. ii, p. 387. Division of *Terebratula* cont. sections characterized by sculpture.

- Epithyridæ**, Quenstedt. *Arthropomata*. 1871.
 Petref. Deutschl. ii, p. 27. Subsect. *Terebratulidæ*, cont. *Terebratula*,
Terebratulina, *Terebratella*, *Nucleata*, *Trigonella*, *Cincta*, *Spirigera*, *Musculus*.
- Epithyris**, Phillips. *Arthropomata*. 1841.
 Pal. Foss. Cornwall & Devon. p. 55. No ex. cited. Diagn. insuffi-
 cient. Genus and family indeterminable.
- Epithyris**, King. *Terebratulidæ*. 1830.
 Perm. Foss. p. 146. pl. vi, f. 30, 45. Type *Terebratulites elongatus*,
 Schlotheim sp. (King, l. c.), Acad. München, vi, p. 27, pl. vii, f. 7-9, 1816.
 Not *Epithyris* Phillips. Syn. *Dielasma*, King.
- Epithyrus**, Paetel. *Arthropomata*. 1875.
 Fam. n. Gatt. Moll. p. 77; lapsus (= *Epithyris*, Phillips).
- Eudesia**, King. *Terebratulidæ*. 1850.
 Perm. Fos. pp. 144, 246. Type *Terebratula orbicularis*, Sow. = *T. cardium*,
 Val. Lam. Hist. An. s. Vert. vol. vi, p. 255, 1819. (Oölitic). Dav. Mon.
 Oölitic Brach. p. 43, pl. xii, f. 13-18. Ann. Mag. Nat. Hist. 1850, pl. xiv,
 f. 47. Quenstedt, Petr. Deutschl. 1871, pl. 45, f. 67-71.
 This genus, being identical with *Waldheimia*, was with-
 drawn by Prof. King in favor of the latter name, which was
 simultaneously published (see Perm. Foss. p. 246). Since
Waldheimia is preoccupied in *Hymenoptera*, this name may
 advantageously be revived for the genus.
- Eumetria**, Hall. *Spiriferidæ*. 1864.
 16th Regent's Rep. pp. 54-5, 59, f. 2-3. Types *Retzia vera*, Hall, l. c. and
R. serpentina, Koninek, Chenu, Man. ii, p. 216, f. 1111. (= *Acamboua*,
 White. Cf. *Retzia*.)
- Euthyris**, Quenstedt. *Spiriferidæ*. 1871.
 Petref. Deutschl. ii, p. 444. Name proposed to replace *Athyris*, which
 Q. regards as inappropriate. But *Seminula*, *Actinoconchus*, and *Spirigera*
 have prior claims if *Athyris* be rejected. (= *Athyris*, McCoy.)
- Fissirostra**, D'Orbigny. *Terebratulidæ*. 1847.
 Comptes Rendus, xxv, p. 269. Cours Élém. Pal. p. 89. (Cf. *Fissuri-*
rostra, D'Orb.)
- Fissirostris**, Gray. *Terebratulidæ*. 1848.
 Ann. Mag. Nat. Hist. ii, p. 436; lapsus (= *Fissirostra*).
- Fissurirostra**, D'Orbigny. *Terebratulidæ*. 1848.
 Pal. Franç. Ter. Cret. iv, p. 32, t. 520. Type *F. recurra*, Defrance sp.
 (D'Orb. l. c.). Davidson, 1856, p. 126, t. vii, f. 6-8. D'Orb. 1850, Ann.
 Sci. Nat. e. xiii, pp. 341, 346, (= *F. elegans* var.). (= *Trigonosemus*, König.)
- Fissuristra**, Paetel. *Terebratulidæ*. 1875.
 Fam. n. Gatt. Moll. p. 82, as of D'Orb.; lapsus (= *Fissirostra*, D'Orb.).
- Fixivalves**, Latreille. *Invertebrata*. 1825.
 Fam. Nat. Règne An.* Fam. Brach. = *Fixivalria*, Berth.

Fixivalvia, Berth.*Invertebrata.* **1827.**

Germ. ed. Latreille, Fam. Nat. p. 196. Fam. Brach. cont. *Orbicula*,
Crania, *Acardo?*, *Sphaerulites?*

Frenula, Dall.*Terebratulidae.* **1871.**

Am. Naturalist, March, 1871, p. 55 (diag. err.). Type *F. (Megerlia)*
Jeffreysi, Dall, Am. Journ. Conch. vii, p. 65, pl. xi, f. 7-10. (Recent.)
 (= *Megerlia*, King, subg. *Ismenia*, Dall, not King.)

Fusella, McCoy.*Spiriferidae.* **1844.**

Carb. Foss. Ireland, pp. 128, 132. Type *Spirifera fusiformis*, Phillips,
 Geol. Yorkshire, p. 217, pl. ix, f. 10-11, as of J. de C. Sowerby MS. 1836.
 (= *Spirifer*, Sow.)

Glossina, Phillips.*Lingulidae.* **1848.**

Mem. Geol. Survey Great Britain, ii, part ii, p. 370. (No diag.) Cites
Lingula attenuata, Sow. Dav. Mon. Sil. Brach. p. 44, t. iii, f. 18-27, and
Lingula crumena, Phil. l. c. p. 369, pl. xxiv, f. 1-6. Dav. Mon. Sil. Brach.
 p. 40, t. ii, f. 1-6. (Sil.) Section containing the trigonal paleozoic *Lingulae*,
 and which will probably eventually be adopted.

Glottidia, Dall.*Lingulidae.* **1870.**

Am. Journ. Conch. vi, p. 157, pl. viii, f. 1-6. (Recent.) Type *Lingula albida*,
 Hinds, Voy. Sulph. p. 71, pl. xix, f. 4.

Gonambonites, Pander.*Strophomenidae.* **1830.**

Beitr. Geogn. Russ. Reiches, p. 77, t. iii, f. 1, xxviii, f. 15, generic diagrams.
 First sp. p. 77, t. xxv, f. 1, *G. lata*, Pander, l. c. (Sil.), which, according to
 Bronn, Ind. Pal. ii, p. 539, with *G. plana* and other of Pander's sp. is the same as
 "*Orthis*" *plana*, Murch. Verneuil & Keys. Geol. Russia, ii, p. 199, t. xi, f. 7, = "*Orthis*"
plana, Quenstedt, Petr. Deutsch. 1871, p. 545, t. 55, f. 37-41, which is a *Klitambonites*.
 Syn. *Orthisina*, King. (= *Klitambonites*.)

Goniclis, Rafinesque.*(Incertae sedis.)* **1831.**

Mon. Biv. Shells Ohio, p. 8. No ex. cited; diag. insuff.

Goniocœlia, Hall.*Spiriferidae.* **1861.**

14th Regent's Rep. p. 101, and 15th do. pl. ii, f. 17-25. Subg. *Meristella*.
 (Upper Held.) Type *Atrypa uniaugulata*, (Conr.) Hall, var. *uniplicata*,
 = *Atrypa unisulcata*, Conr., Hall, Pal. N. York, iv, p. 309. (= *Pentagonia*,
 Cozzens.)

Gonotrema, Rafinesque.*(Incertae sedis.)* **1820.**

Ann. Sci. Phys. Bruxelles, v, p. 232, in Mon. Turbinolies de Kentucky.
 Short descr. No ex. cited. Ibid. Mon. Biv. Shells Ohio, p. 7. No ex. cited.

Gotlandia, Dall.*Trimerellidae.* **1870.**

Am. Journ. Conch. vi, p. 160. Type *G. Lindstromi*, Dall, l. c. p. 161, = *Trimerella*,
 sp. Lindström, Ofv. K. Vet. Akad. Forh. f. 1867, p. 253, pl. 21. (Sil.) Provisional
 genus proposed on Lindström's figures, which, proving to be inaccurate, the
 genus was withdrawn by Dall, l. c. vii, p. 81, 1871. (= *Trimerella*, Bill.)

- Griphus**, Blainville. *Terebratulidae*. 1828.
Diet. Sci. Nat. liii, p. 145, div. Terebr. = *Gryphus*, Meg.
- Gryphites**, Lhwyd. *Invertebrata*. 1699.
Lith. Brit. Ichn. p. 26, and other non-binomial authors. Cont. *Gryphæa*,
sp. et *Productus*, sp. foss.
- Gryphus**, Megerle von Muhlfield. *Terebratulidae*. 1811.
Schrift. Berl. Ges. Naturf. Freunde, 1811, p. 64. Ex. *Terebratala vitrea*,
Lam. Davidson, 1853, pl. vi, f. 1-2. Not *Gryphus*, Brisson or Wagler.
(= *Terebratala*, Muller.)
- Gryphytes**, Da Costa. *Invertebrata*. 1776.
Elem. Conch. p. 250. Non-binomial. Cf. *Gryphites*.
- Gwynia**, King. *Terebratulidae*. 1859.
Proc. Dublin Univ. Zool.-Bot. Assoc. i, p. 258, f. 1-5. Type *G. capsula*,
King, l. c. Reeve, Conch. Icon. x, f. 39. An immature form, perhaps
Waldheimia cranium test. juv.
- Gypidia**, Dalman. *Pentameridae*. 1828.
Kongl. Vet. Acad. Handl. f. 1827, pp. 93, 100. Sole ex. l. c. p. 125, t. iv,
f. 1, a-g. *Gypidia conchidium*, Dalman, = *Anomites c.* Wahlenberg, Act.
Upsala, viii, p. 67, + *Conchidium biloculare*, Linné, Mus. Tessin. p. 90, t. v,
f. 8. (Sil.) Murch. Vern. et Keys. Geol. Rus. Ural, ii, p. 116, t. 8, f. 2.
Proposed by Dalman, who considered it as partly = *Pentamerus*, Sow. which he regarded as preoccupied by *Pentamera*, Dumeril, gen. *Colcoptera*, 1806. Why does Dav. 1856,
p. 173, note, state that *Uncites gryphus* is included by Dalman? It does not appear in the synonymy, nor do the
figures seem to agree. (= *Conchidium*, Lin.)
- Gypidia**, Hall. *Pentameridae*. 1867.
Notice Pal. N. York, vol. iv, p. 164, Mar. 1867. Pal. N. York, vol. iv,
p. 374. Type *G. conchidium*, Dalm. (= *Gypidia*, Dalm.).
- Gypidium**, Beyrich. *Pentamerida*. 1837.
Beitr. zur Kenntn. Verst. Rhein. Uebergeb.* (= *Gypidia*, Dalm.)
- Gypidula**, Hall. *Pentamerida*. 1867.
Notice Pal. N. York, vol. iv, p. 163, Mar. 1867. (Dev.) Pal. N. York,
iv, pp. 373, 380, pl. 58 a (all), 1867. Type *Pentamerus occidentalis*, Hall,
Geol. Iowa, i, part ii, p. 514, pl. vi, f. 2, 1858, but not of Hall, Pal. N.
York, ii, p. 341, 1852.
- Hapalosia**, Agassiz. *Mollusca*. 1847.
Nom. Zool. Index, p. 496, = *Apalosia*, Raf. corrig. q. v.
- Helictopoda**, Gray. *Brachiopoda*. 1848.
Ann. Mag. Nat. Hist. ii, p. 436. Subclass Brach. cont. *Sclerobrachia*,
Sarcicobrachia.

Helmersenia, Pander.? *Obolidae*. 1861.

Bull. Acad. Imp. Sci. St. Petersburg, iii, p. 47, pl. ii, f. 2, a-g. Type
H. jerémjewi, Pander, l. c. (mel. *ieremicfi*). Not seen.

Helmintholithus, Linné.*Invertebrata*. 1760.

Syst. Nat. ed. xi, ii, p. 162. Subclass inv. foss. cont. Vermes foss.
 incl. some brachiopods.

Hemiasterias, Herrmannsen.

(Incertæ sedis.) 1847.

Index Gen. Mal. i, p. 524, as of Raf. (= *Hemisterias*, R.)

Hemiprionites, Agassiz.*Strophomenidae*. 1847.

Nom. Zool. Index, p. 511; lapsus (= *Hemipronites*, Pand.).

Hemipronites, Pander.*Strophomenidae*. 1830.

Beitr. Geogn. Russ. Reiches, pp. 71, 74, t. iii, f. 14 (generic only). Section or subgenus of *Klitambonites*, fully described; first sp. p. 74, *H. tumida*, Pand. t. xviii, f. 6, a-d. (Sil.) (= *Klitambonites*, Pander.)

The relative application of this name and the names *Strepatorhynchus*, *Leptæna*, *Strophomena*, *Plectambonites*, and *Hipparionyx* is involved in more obscurity, and has been more variously regarded by different authors, than almost any other case of a similar nature in the annals of malacological nomenclature. This has been still further complicated by the uncertainty which still exists in regard to the internal characters of most of the species, and the different values assigned by authors to these characters when they have been made known.

A reference to the various names above cited will disclose the views taken by several authors, and further elucidate the historical account which follows, when it may not appear sufficiently full.

In 1848, Bronn, in the Index Paleontologicus, i, p. 585, refers nineteen of Pander's twenty-one nominal species to "*Orthis*" *hemipronites*, von Buch (Beitr. Best. Gebirgs-Form. Russl. 1840, p. 20), including Pander's first or typical species *H. tumida*, the specific name of which, of course, is entitled to priority without regard to its generic affiliations. If this be correct, it would certainly seem, irrespective of other considerations, as if *H. tumida* (or *hemipronites*) was entitled to be considered as Pander's type. In case the genus *Hemipronites*, as typified by *H. tumida*, be synonymous with some previously named group, there would still remain *H. alata*

and *H. globosa*, Pander, to which the name *Hemipronites* might be applied if they prove distinct from any group named before 1830; and which, under Pander's name, were thus separated as a section of *Orthis* by Bronn in 1849 (iii, p. 228). To this it may be objected that the first species is represented by an unrecognizable cast of the interior, and the second bears considerable resemblance, as far as the figure is concerned, to a species of *Porambonites*. I shall therefore consider *H. tumida* and vars. as forming the typical species.

Quenstedt (Petr. Deutschl. 1871, p. 545, t. 55, f. 32-34) has figured the interior of what he states to be this species, which he regards as one of his somewhat heterogeneous group of *Orthides*, and affiliates to *Orthisina*, D'Orb. (= *Klitambonites*). The character of this interior does not appear to differ materially from that of *Klitambonites*, but, in deciding, much will depend on the view taken by each individual paleontologist as to the value of characters which appear to vary as much within the species as do the so-called generic characters between different groups of species. According to Quenstedt's figures, the difference between *O. hemipronites* (= *tumida*, type of *Hemipronites*) and *O. anomala* (= *adscendens*, teste Quenstedt, type of *Klitambonites* and first species of *Orthisina*, D'Orb.) is merely a question of degree of breadth of area and prolongation of the median ventral septum. *O. plana* seems to be of very similar type. For present purposes, it will suffice to regard *Hemipronites* and *Orthisina* as synonyms of *Klitambonites*, leaving to paleontologists the duty of determining whether there are grounds for ultimate separation of the species which they contain.

Now Davidson and some other authors have (as it seems to the writer), with evident propriety, taken Blainville's sole species (*S. rugosa*) as the type of the genus *Strophomena*, of which Blainville alone can be considered as the author; this species is generally admitted to be the same as *S. planumbona*, Hall, figured by Meek in the Paleontology of Ohio, i, p. 74, pl. 6, f. 3 a-g, 1873, and by Davidson, 1856, t. xi, f. 37-39.

In 1843, Vanuxem (Geol. Rep. Third Distr. N. York, p. 124,

f. 4) founded his genus *Hipparionyx* on a species to which he gave the name of *proximus*, and which has been fully illustrated by Prof. Hall under the name of *Orthis hipparionyx* in Pal. N. York, vol. iii. Subsequently Prof. Hall (Sixteenth Regent's Rep. p. 65) refers to this species as an extreme form of the genus *Streptorhynchus* of King, which, if true, would reduce Prof. King's name to a synonym, since Vanuxem's genus rests on the character of its type, and its validity is not affected by the original inclusion with that type of species not congeneric.

Prof. King, in 1850 (Perm. Foss. p. 107), erected into a genus the *Terebratula pelargonata* of Schlotheim, under the name of *Streptorhynchus*. This and *O. crenistria* were for some time afterward included by Davidson in *Orthisina* (= *Klitambonites*), but have since been separated from that connection, and recognized by him as species of *Streptorhynchus*, which he adopts as a section of *Strophomena*.

In 1864, Mr. F. B. Meek (Pal. Upper Missouri, part i, p. 25) expresses the opinion that *Streptorhynchus* is not separated by any definite characters from *Hemipronites*, as he understood it (= *Strophomena*, Blainville), and with *Hipparionyx* unites the two under Pander's name, which he adopts. In 1873 (l. c.), Mr. Meek, being unaware that Rafinesque's genus *Strophomenes* had not been described prior to Blainville's description of *Strophomena*, and relying on the statement that a specimen of the *Anomites rhomboidalis* of Wahlenburg had been labelled *Strophomena rugosa* by Rafinesque himself, proposed to adopt that as the type of *Strophomena* (a name never published by Rafinesque), and to retain the typical species of Blainville and its congeners under the name of *Hemipronites*. In Pal. Ohio, ii, p. 281, Mr. Meek reiterates his opinions of 1864 and 1873. If the propositions upon which this opinion was founded, namely, that Pander's type of *Hemipronites* was a "true *Streptorhynchus* of King", and that between the latter and the *Strophomenoid* forms typified by *S. planumbona* there is no difference except of degree, had proved unassailable, no question would arise as to the propriety of his conclusions.

However, since 1863, numerous investigations have re-

sulted in greater knowledge of the internal arrangements of the types of these groups, and greatly modified the former method of classification of these animals, which was based chiefly on external characters. Had Mr. Meek not been prevented from extending his investigations by the melancholy and long-continued illness which terminated in his death, it is very probable that he would have reconsidered his earlier views. At all events, it is evident that certain differences exist between the above-mentioned groups, which are apparently as important as many which have formed the basis of accepted genera, although it cannot be denied that a general and rather gradual transition may be traced between the different sections of this family. These it appears better, for the sake of discrimination, to accept for the present, leaving for the future the task of thorough correlation and subordination.

The preceding is but the beginning of these complications.

In 1828, Dalman had described the genus *Leptaena* (*q. v.*) with four species (and references to others which he supposed to belong to it), which formed a heterogeneous assemblage. Of the four species from which Dalman's type must be selected, *L. euglypha*, the third, is a typical *Strophomena* (Blainville), agreeing with *S. rugosa*, Bl. (= *planumbona*, Hall), in having the dorsal (or hæmal) valve convex, while the ventral or socket valve is concave externally. The first and second, *L. rugosa*, Dalm. (= *rhomboidalis*), and *depressa*, Dalm., are, according to Mr. Davidson, mere varieties of one species. This he includes in *Strophomena*, not considering the differences by which it is distinguished from the type of the genus *Strophomena* (Blainville) to be of generic or subgeneric importance. These differences are chiefly that the relative convexity and concavity of the valves are reversed, and that certain minute differences in the form of the muscular and vascular impressions, in the grooving of the tips of the cardinal process, or of the hinge-line, have been noticed, and also some differences of form, apparently owing to the general convexity, or to the sharp geniculation of the valves in various species. The fourth species, *L. transversalis*, Dalm., exhibits differences which seemed suf-

ficient to Mr. Davidson to authorize its separation from *Strophomena* (1853, p. 108), and thus retain the name *Leptaena*, which had been so widely used in paleontological literature. This species* thus became the type of the restricted genus, and the latter has very generally been adopted.

In 1830, however, Pander described his genus *Plectambonites*, in which he placed a number of species, the whole forming an assemblage apparently about equivalent to *Leptaena* or *Strophomena*, as these terms were used in their unrestricted sense by early writers. The interior of some of his species is unknown, including the first species, and there are probably both *Leptaenas* and *Strophomenas* (as restricted) contained in the genus. But his first of two generic figures appears to be the dorsal valve of a species of *Strophomena* of the *rhomboidalis* type, while his *P. triangularis*, *imbrex*, and another (all vars. of one sp.), which have been examined and figured by Mr. Davidson, have the dorsal valve concave, as in *rhomboidalis*. Should therefore it be necessary (as seems improbable) to separate the genus *Strophomena* as understood by Davidson into two groups, respectively typified by *rhomboidalis* and *rugosa* (*planumbona*), Pander's name might be utilized for the former, although M'Coy has (1844) also suggested a name (*Leptagonia*) for this identical group.

Stropheodonta of Hall (1850, Pal. N. Y. ii) seems tolerably distinct from the above, if the total absence of any indication of a covered or open foramen, which is said to characterize it, be confirmed.

A different arrangement from that adopted by Davidson was proposed by Professor King, by which *S. rhomboidalis* was to represent *Leptaena*, and *L. transversalis* and congeners would be the exemplars of *Plectambonites*. Whatever may have been the points in favor of this arrangement, it may be said that no part of it was imperatively required by the rules of nomenclature, and, as another grouping has come into general use, which is at least equally conformable to those rules, it would be highly undesirable to inaugurate any further or unnecessary changes.

Orthothetes of Evans (1837, q. v.) is also a synonym of

Streptorhynchus or *Strophomena*. At the same time that he proposed the genus *Hemipronites*, Pander also described two other genera, founded on unimportant differences in the character of the foramen, partly natural, partly accidental to the specimens. The respective lists of species were, as in the preceding cases, chiefly made up of unimportant individual variations. Of *Orthambonites*, Broun refers eleven out of eighteen species, including the first, to *Orthis calligramma*, Dalman, while of the genus *Gonambonites*, with twenty-four species, fourteen are referred to *Orthis inflexa*, Vern., and eight, including the first, to *O. plana*, Vern. This species is figured by Quenstedt, and is a *Klitambonites* (or *Orthisina*), and it seems at least probable, from Pander's figures, that more of his species belonged there, while others will be referable to *Strophomena*, &c. *Orthambonites* must be considered a synonym of *Orthis*, at least for the present; and there does not at present appear to be anything not referable to previously named genera in *Gonambonites*.

The conclusions to which this review of the history of these names would seem to lead, may be expressed synonymically as follows:

Genus STROPHOMENA, Blainville.

- a. *Strophomena (rugosa)*, Bl., 1825, Dav. 1853.
Hemipronites (planumbona), Meek, 1873.
Leptaena (euglyphu), Dalman, 1828.
- b. *Hippariouyr (proximus)*, Vanuxem, 1843.
Orthothetes (? arenistria), Phil. Evans, MSS. 1837?, Fischer, 1850.
Streptorhynchus (pelargonatus), Schl., King, 1850.
- bb. *Plectambonites (rhomboidalis?)*, Pander, 1830.
Strophomena (rhomboidalis), Wahl., Meek, 1873.
Leptaena (rhomboidalis), Dalman, 1828.
Leptaena (rhomboidalis), Wahl., King, 1846.
Leptagonia (analogu), Phil., McCoy, 1844.
- c. *Leptaena (transversalis)*, Dalman, 1828, Dav. 1853.
Plectambonites (transversa), King, 1850.
- d. *Stropheodonta (demissa)*, Conr., Hall, 1850.

Genus KLITAMBONITES, Pander.

- a. *Klitambonites (adscendens)*, Pander, 1830.
Pronites (adscendens), Pander, 1830.
Hemipronites (tumida), Pander, 1830.
Gonambonites (plana), Pander, 1830.
Orthisina (anomala), D'Orbigny, 1847.

Genus ORTHIS, Dalman.

- a. *Orthis (calligramma)*, Dalman, 1828.
Orthambonites (calligramma), Pander, 1830.
Schizophoria (striatula), King, 1850.

- Hemipronites**, Meek. *Strophomenidae*. 1873.
 Pal. Ohio, i, p. 74. Subg. *Strophomena*. Type *S. planumbona*, Hall, Dav. 1856, pl. xi, f. 37-39. (= *Strophomena*, Bl.)
- Hemisterias**, Rafinesque. (*Incertæ sedis*). 1832.
 Atlantic Journal, iv, p. 142, cut. *H. quadriloba*, Raf. l. c. sole ex. (Referred by Herrm. to the Brach.)
- Hemithiris**, D'Orbigny. *Rhynchonellidae*. 1847.
 Comptes Rendus, xxv, p. 268. No ex. cited. Ann. Sci. Nat. viii, p. 246; xiii, p. 322, 1850. Type *Rhynchonella psittacea*, Gmel. sp. Dav. 1856, pl. x, f. 8, 9, 10, 15, 16, 23. Syn. *Hypothyris*, Fbs. & Hanl.
- Hemithyris**, Bronn. *Rhynchonellidae*. 1848.
 Jahrb. Min. p. 246. (= *Hemithiris*, D'Orb. corrig.)
- Heterogangliata**, Owen. *Invertebrata*. 1835.
 Lect. on Comp. Anatomy (ed. 1843, p. 13). Name proposed by Owen for the subkingdom of *Mollusca*, and erroneously considered by Paetel to be equivalent to the class Brachiopoda. (= *Mollusca*, Cuv.)
- Hipparionyx**, Vanuxem. *Strophomenidae*. 1842.
 Geol. Rep. Third District N. York, p. 124, f. 4. (Dev.) Type *H. proximus*, Van. l. c. = *Orthis hipparionix*, Dav. Mon. Dev. Brach. p. 90. Hall, 16th Reg. Rep. p. 65, f. 6. Ibid. Pal. N. York, iii, p. 407, pl. 89, f. 1-4; pl. 90, f. 1-7; pl. 91, f. 4, 5; pl. 94, f. 5, 1859. Some sp. of *Atrypa* were included in Vanuxem's list. Syn. *Streptorhynchus*, King.
- Hipponyx**, Morris. *Gasteropoda*. 1843.
 Brit. Foss. p. 121. Gen. gast., sp. ad Brach. ref. Morris in err.
- Histerolithus**, Auctt. (*Incertæ sedis*).
 Cf. *Hysteroolithus*.
- Hinniphoria**, Bronn. ? *Terebratulidae*. 1862.
 Bronn, Klass. u. Ordn. Thierr. 1ste Abth. p. 309, 1862, in list. (Jura.) (Cf. *Hynniphoria*, Suess.)
- Hynniphoria**, Suess. ? *Terebratulidae*. 1858.
 Beitr. Paleont. Oesterr. von Hauer, Bd. i, Heft 2, p. 44, t. v, f. 4-8. Type *H. globularis*, Suess. l. c. (I have not access to this work.)
 The relations of this genus appear doubtful.
- Hynniphoria**, Quenstedt. *Terebratulidae*. 1871.
 Petref. Deutschl. ii, p. 403, as of Suess. Ex. *Terebratula cubica*, Quenstedt, l. c. atlas, pl. 49, f. 90, 91.
- Hypodema**, Koninck. *Coelenterata*. 1852.
 Notice sur les gen. Hypodema, &c. p. 12, pl. ii, f. 1-3, a-d. (Carb.) Type *Calceola Dumontana*, Kon. (1843), l. c.
- Hypothyridæ**, Morris. *Arthropomata*. 1846.
 Quart. Journ. Geol. Soc. Lond. ii, p. 387. Division *Terebratulidae* cont. sections characterized by their sculpture or form.

- Hypothyridæ**, King. *Arthropomata*. 1850.
Perm. Foss. p. 81. Fam. Brach. cont. *Isorhynchus*, *Hypothyris*, *Camero-*
phoria, *Uncites*, *Pentamercus*.
- Hypothyridæ**, Quenstedt. *Arthropomata*. 1871.
Petref. Deutschl. ii, p. 27. Subsect. *Terebratulidæ* cont. *Rhynchonella*,
Camero-phoria, *Camarella*, *Atrypa*, *Pentamercus*, *Uncites*, *Strigocephalus*, *Pec-*
tunculus.
- Hypothyris**, Phillips. ? *Rhynchonellidæ*. 1841.
Pal. Fos. Cornwall & Devon. p. 55. "Beak acute; perforation below
it;" only diagnosis; no ex. cited and the name not used in the specific
descriptions.
- Hypothyris**, King. *Rhynchonellidæ*. 1846.
Ann. Mag. Nat. Hist. xviii, p. 28. First sp. *H. cuboides*, Sow. sp. Geol.
Trans. v, p. 704, t. 56, f. 17. Dav. Mon. Dev. Brach. p. 65, t. xiii, f. 17-
21. (= *Rhynchonella*, Fisch.)
- Hypothyris**, Forbes and Hanley. *Rhynchonellidæ*. 1853.
Brit. Moll. ii, p. 346. Sole ex. *Anomia psittacca*, Gmel. S. N. i, F. & H.
l. c. pl. lvii, f. 1-3. (= *Hemithiris*, D'Orb.)
- Hysterolites**, Schlotheim. (*Incertæ sedis*). 1820.
Petref. p. 247, pl. xvi-xviii. Subsect. *Terebratulites* cont. spinose fossil
brachiopods. (Cf. *Hysterolithus*.)
- Hysterolithes**, Link. (*Incertæ sedis*). 1809.
Beschr. Rostock, Samml. iv, p. 29. (Cf. *Hysterolithus*.)
- Hysterolithos**, Grew. (*Incertæ sedis*). 1681.
Mus. Soc. Reg. p. 258. Non-binomial. (Cf. *Hysterolithus*.)
- Hysterolithus**, Aldrovandus. (*Incertæ sedis*). 1648.
Mus. met. p. 597. Non-binomial. Followed by Walch, Waller, Schrö-
ter, and other non-binomial authors. Included globose, spinose fossil bi-
valves, *Spoudyli*, *Producti*, et cetera.
- Hysterolithus**, Quenstedt. *Spiriferidæ*. 1871.
Petref. Deutschl. ii, p. 27, 472-4, genus *Productidæ*. Type *Spirifer*
ostiolatus, Schlorh. sp. Quenst. l. c. atlas, pl. 52, f. 1-7, 12-13, = *Hystero-*
lites hystericus, Schloth. Petr. 1820, p. 249, pl. 29, f. 1. (= *Spirifer*, Sow.)
- Hysteropectra**, Cardan. (*Incertæ sedis*). 1554.
De subtil. lib. vii, p. 222. Non-binomial. (Cf. *Hysterolithus*, Aldr.)
- Inaequivalves**, Latreille. *Arthropomata*. 1825.
Fam. Nat. Règne An.* (Fam. Brach. = *Inaequivalvia*, Berth.)
- Inaequivalvia**, Berth. *Arthropomata*. 1827.
Germ. ed. Latreille, Fam. Nat. p. 196. Fam. Brach. cont. gen. *Tere-*
bratula, senso magno.
- Inarticulata**, Huxley. *Brachiopoda*. 1864.
Lect. Class. An.* Intr. Class. An. 1869, p. 116. Ord. cont. Brach. in-
articulata. (= *Lyopomata*, Owen.)

Iphidea, Billings.

Arthropomata? 1874.

Pal. Fos. Canada, ii, pt. i, (Aug.) p. 76, f. 44. Type *I. bella*, Billings, 1 c. (Sil.) Interior unknown.

Allocated to *Kutorgina* and *Acrotreta* by Billings; but the figure resembles a small valve of *Klitambonites anomala* (*Orthisina anomala*, Dav. 1856, f. 21), Schlotheim.

Isilia, Rafinesque.

Arthropomata. 1831.

Mon. Biv. Shells Ohio, p. 7. Sect. Terebrariorum cont. *Terebratula*, *Spinifer*, *Gonotrema*, *Amblotrema*.

Ismenia, King.

Terebratulidæ. 1850.

Perm. Foss. pp. 81, 142 (not p. 245). Type *Terebratulites pectunculus*, Schlotheim, Quenst. Handb. Petr. p. 466, pl. 37, f. 23-25. Ibid. Gray, B. M. Cat. p. 104. (= *Megerlia*.)

Ismenia, King (2).

Terebratulidæ. 1850.

Perm. Foss. p. 245, (not pp. 81, 142). Type *Terebratulites pectunculoides*, Schlotheim, Quenst. Handb. Petr. p. 464, pl. 37, f. 15-18. (Not of Gray nor of King, p. 142.) (= *Terebratella*, D'Orb.)

Ismenia, Dall.

Terebratulidæ. 1871.

Am. Journ. Conch. vii, p. 6. Subg. *Megerlia*, King. Type *Terebratula sanguinea*, Sow. Thes. Conchyl. i, p. 357, pl. 71, f. 71-73. (= *Ismenia*, Gray; King, p. 142; + *Frenula*, Dall.)

Isorhynchus, King.

Porambonitidæ. 1850.

Perm. Foss. p. 112. Type *Terebratulites æquirostris*, Schl. Verneuil, Geol. Rus. ii, pl. iii, f. i. Cf. Dav. 1853, p. 99, t. vii, f. 120-126. (= *Porambonites*, Pand.)

Keyserlingia, Pander.

Obolidæ? 1861.

Bull. Imp. Acad. Sci. St. Petersburg, iii, p. 46, pl. ii, f. 1 a-g. Type *Obicula reversa*, Verneuil, Pander, 1 c. Not seen. (Cf. *Obolella*.)

Kingena, Davidson.

Terebratulidæ. 1852.

Mon. Brit. Cret. Brach. p. 42, t. iv, f. 15-28, t. v, f. 1-4. Type *Terebratula lima*, DeFrance, Dict. Sci. Nat. liii, p. 155, 1828. Davidson, 1 c. subg. *Terebratella*.

Klitambonites, Pander.

Strophomenidæ. 1830.

Beitr. Geogn. Russ. Reiches, p. 70, t. iii, f. 14, t. xxviii, f. 16, 17. First sp. *Pronites adscendens*, Pander, p. 72, pl. xvii, f. 6, Dav. 1856, pl. xi, f. 24, 26 (+ *P. alta*, P. 1 c. f. 5, = var. præc. teste Murchison; Chenu, Man. ii, p. 223, f. 1147, 1862). Sil.

(Syn. *Pronites*, Pander, not Illiger; *Gonambonites*, Pander, *Orthisina*, D'Orb.)

Genus fully described and all the species divided between the subgenera *Pronites* and *Hemipronites* (q. v.). The figures cited are given as generic merely. The first sp. of *Pronites* (*adscendens*, P.) must be taken as the type of the genus, especially as *Pronites* is preoccupied by Illiger for a

genus of birds, and also because one of the subgenera must be left by the rules of nomenclature to contain the typical species, and therefore *Pronites* would necessarily lapse even if it were not pre-occupied.

Koninckia, Woodward.

Atrypidae. 1854?

Man. Rec. & Foss. Shells, p. 231, f. 145; Bronn, Thierr. iii, i, 302, 1862. Type *Producta Leonhardi*, Wissm.; lapsus, = *Koninckina*, Sness.

Koninckina, Sness.

Atrypidae. 1853.

Davidson, 1853, p. 92. Type *Producta Leonhardi*, Wissm. Dav. l. c. pl. viii, f. 194-198. (Trias.)

Koninckinidae, Davidson.

Arthropomata. 1853.

Intr. p. 51. Fam. Brach. cont. *Koninckina*.

Kortugina, Davidson.

Obolidae. 1871.

Mon. Sil. Brach. expl. pl. l. lapsus, = *Kutorgina*, Bill.

Kraussia, Davidson.

Terebratulidae. 1852.

Ann. Mag. Nat. Hist. ix, p. 369. Type *K. rubra*, Dav. l. c. = *Anomia rubra*, Pallas, Mis. Zool. pl. xiv, f. 2, 11, 1766. Reeve, Conch. Icon. ix, f. 37, a-c. Not *Kraussia*, Dana, 1852, gen. crustac. (= *Kraussina* Dav.)

Kraussina, Davidson.

Terebratulidae. 1859.

Sitzungsber. K. Ak. Wiss. Wien, Bd. 37, p. 210, and Annals Mag. Nat. Hist. 1861, p. 39. Proposed for *Kraussia*, Dav. præoc. by Dana in Crustacea.

Kraussinina, Paetel.

Terebratulidae. 1875.

Fam. n. Gatt. Moll. p. 104, lapsus, = *Kraussina*, Dav.

Kraussininae, Dall.

Terebratulidae. 1876.

Am. Journ. Conch. vi, p. 100. Subfam. *Terebratulidae* cont. *Kraussina*, Bouchardla.

Kriopen, Oken.

Brachiopoda. 1815.

Zool. vii, p. 249. Fam. Brach. cont. *Terebratula*, *Acardo*?, *Orbicula*, *Lingula*.

Kutorgina, Billings.

(*Incertæ sedis*.) 1861.

Paleoz. Foss. Can. Geol. Survey, i, p. 8, f. 9 (not 8 and 10). Type *Obolella cingulata*, Bill. Sil. (advance sheets Nov. 1861, l. c.). Subg. *Obolella*, Bill. l. c.

Billings's subgenus was established on the internal casts of which fig. 9 is a representation. See note on p. 9, l. c. It is very doubtful if it belongs to the *Obolidae* at all. The valves (figures 8 and 10) therewith delineated are evidently not related to *Obolella*, as already pointed out by Davidson (Mon. Sil. Brach., p. 342, app.); and seem to belong not only to another species, from the internal cast figured by Bil-

lings, but also to a different generic group. Whether this be identical with a described genus, or whether it is still uncharacterized, is doubtful, and cannot be decided until the interior is known. Such valves have been identified with *Obolella Phillipsi*, Holl (Quart. Journ. Geol. Soc. xxi, p. 101-2, f. 10 a-b, 1864, by Messrs. Holl and Davidson (l. c.), which has been figured by Davidson (Mon. Sil. Brach., pp. 62, 342, pl. iv, f. 17-19, 1866, and pl. I, f. 25, 1870). Mr. Whitfield, who kindly called the writer's attention to the dissimilarities between Billings's figures, is of the opinion that *O. Phillipsi* belongs to an undescribed generic group.

Lampas, Meuschen. *Arthropomata*. 1787.

Mus. Gev. p. 438. Non-binomial. (Cf. *Lampas*, Humph.)

Lampas, (Humphrey) Anonymous. *Arthropomata*. 1797.

Mus. Calonn. p. 45 (May). No diagnosis or references. First sp. *Anomia terebratula*, Lin. Other sp. are *Rhynchonella*, *Megerlia*, &c. (= *Terebratula*, Müller.)

Lampus, Sowerby. *Arthropomata*. 1842.

Conch. Man. ed. ii, p. 169, lapsus, = *Lampas*, Humph.

Laqueus, Dall. *Terebratulida*. 1870.

Am. Journ. Conch. vi, p. 123, subg. *Terebratella*. Type *Terebratula californica*, Koch, Dall, l. c. pl. vii, fig. f, pl. viii, fig. 9-10.

Leiorhynchus, Hall. *Rhynchonellida*. ^{1860.}
1861?

13th Regent's Rep. p. 75. Types *Atrypa quadricostata*, Hall, l. c. p. 86, & Rep. Fourth Distr. N. York, p. 223, f. 2; and *Atrypa mesacostalis*, Hall, l. c. p. 85 (Chem.) & Note on Foss. Chemung Group, p. 64, f. 1 a-b. Not *Liorhynchus*, Rud. gen. Coleopt. (Cf. *Meristella*, Hall, 1862, not 1861.

Leptaena, Dalman. *Strophomenida*. 1828.

Kongl. Vet. Acad. Handl. 1827, pp. 93, 94. First sp. p. 106, *Producta rugosa*, Hisinger, Act. Holmie, 1826, p. 333. Dalman, l. c. pl. i, f. 1, = *Anomites rhomboidalis*, Wahl. Act. Upsal. viii, p. 65. (This and *L. depressa*, Dalman, second sp. p. 107, t. i, f. 2, + *L. euglyphia*, Dalman, third sp. l. c. p. 108, t. i, f. 3, a-b; Hisinger sp. Bidr. Sver. Geogn. t. vi, p. 4, —are true *Strophomenas* fide Davidson.) Fourth sp. l. c. p. 109, t. i, f. 4 a-d. *L. transversalis*, Dalman, is taken by Davidson as type, 1853, pl. viii, f. 176-180; 1856, pl. xii, f. 1-5.

Leptaena, McCoy. *Productida*. 1844.

Carb. Foss. Ireland, pp. 105, 118. First sp. *L. convoluta*, Phillips, Pal. Foss. Cornwall & Devon, p. 57, pl. 24, f. 96. In the diagnosis, however, *L. lata*, von Buch, (= *Chonetes striatella*, Koninek, Mon. *Chonetes*, p. 200, pl. xx, f. 5 a-g), is mentioned in a way to indicate it as McCoy's type. (= *Chonetes*, Fisch.)

Leptaena, King.*Strophomenida.* 1846.

Ann. Mag. Nat. Hist. xviii, pp. 28, 36. 1st sp. *L. rugosa*, Dalm. (= *rhom-boidalis*). Ibid. Perm. Foss. 1850, p. 81, 104, same type, and adds *L. analoga*, Phillips, as also typical, = *Leptaena*, Dalman, pars, not Dav. = *Strophomena*, Davidson pars. (= *Plectambonites*, Pander.)

Leptaena, Davidson.*Strophomenida.* 1853.

Intr. p. 108. Type *L. transversalis*, Dalm. pl. viii, f. 176-180. Ibid. 1856, p. 205, same type, pl. xii, f. 1-5. Syn. *Plectambonites*, King; not *Leptaena*, King.

Leptaenacea, F. Braun.*Arthropomata.* 1840.

Bayr. Petref. p. 45. Fam. Brach. cont. *Leptaena*.

Leptaenalosia, King.*Productida.* 1845.

Murch. Vernenil & Keys. Geol. Rus. Ural, ii, p. 281. (King, olim.) (= *Strophalosia*, King.)

Leptagonia, McCoy.*Strophomenida.* 1841.

Carb. Foss. Ireland, p. 116, f. 11-13. First sp., also mentioned in diagnosis, *Producta analoga*, Phillips, Geol. Yorkshire, 1836, p. 215, pl. vii, f. 10. McCoy, l. c. p. 117, f. 13. (= *Plectambonites*, Pand.)

Leptobolus, Hall.*Obolida.* 1871.

24th Regent's Rep. p. 226, pl. vii, f. 19-20. Oct. (Hudson R. group). Type *L. lepis*, Hall, l. c. Ibid. Hall & Whitfield, Ohio Pal. ii, p. 69, 1875. (See *Aulonotreta*, Kutorga.)

Leptobulus, Hall.*Obolida.* 1871.

24th Regent's Rep. p. 226, passim, lapsus, = *Leptobolus*. Ibid. U. P. James, Cat. Foss. Cincin. 1875.

Leptocoelia, Hall.*Atrypida.* 1857.

10th Regent's Rep. p. 107. No diagn. First sp. *L. concava*, Hall, Pal. N. York, iii, pl. 38, f. 1-7. (Group heterogeneous.)

Leptocoelia, Hall.*Terebratulida?* 1859.

12th Regent's Rep. pp. 32-3, f. 1, 2, 4. First figure, *L. flabellites*, Hall, l. c. (Comp. *Tropidoleptus*, *Centronella*.)

After excluding the *L. concava* (*Coclospira*, Hall), this group appears to belong to the *Terebratulida*. It is true that the shell-structure appears to be fibrous, which, if normal, would remove it from this family as generally defined, although the cases of *Rhynchopora* and *Syringothyris* warn the student that too much confidence is not to be placed in the family value of this character, and that there is a possibility of metamorphism rendering the punctation imperceptible, so as to deceive the most eminent and careful observers. The character of the loop, if correctly interpreted and figured, is certainly very similar to that of the *Terebratulida*, where it seems best to leave it until more is known.

- Leptogonia**, Agassiz. *Strophomenidae*. 1847.
 Nom. Zool. Index, p. 593, lapsus, = *Leptagonia*, McCoy.
- Les Acardes**, Desmoulins. *Invertebrata*. 1826
 Bull. Hist. Nat. Soc. Lin. de Bordeaux, i, p. 241. Fam. incl. *Spharulites*, *Hippurites*, *Calceola*. Not of Rang.
- Les Cranies**, Ferussac. *Brachiopoda*. 1819
 Tabl. Syst. p. xxxviii. Fam. Brach. cont. *Orbicula*, *Crania*, *Thucidea*.
- Les Cranies**, Rang. *Lyopomata*. 1829.
 Man. Moll. p. 262. Fam. Brach. cont. *Crania*, *Orbicula*, *Discina*.
- Les Lingules**, Ferussac. *Lyopomata*. 1819.
 Tabl. Syst. p. xxxviii. Fam. Brach. cont. *Lingula*. Ibid. Rang., Man. Moll. p. 257, 1829.
- Les Orbicules**, Cuvier. *Lyopomata*. 1798.
 Leçons d'Anat. Comp. i, p. 5. Fam. Brach. cont. *Crania*, *Orbicula*.
- Les Ostracées**, Lamarek. *Invertebrata*. 1809.
 Phil. Zool. (ed. 1830, p. 317). Fam. incl., among other things, *Crania*.
- Les Terebratules**, Ferussac. *Arthropomata*. 1819.
 Tabl. Syst. p. xxxviii. Fam. Brach. cont. *Terebratula*, *Magas*.
- Les Terebratules**, Rang. *Invertebrata*. 1829.
 Man. Moll. p. 258. Fam. cont. *Terebratula*, *Pentastère*, *Strygocephale*, *Spirifère*, *Magas*, *Strophonema*, *Thucidea*, *Calceola*.
- Libera**, Fleming. *Arthropomata*. 1828.
 Brit. An. pp. 225, 367. Fam. Brach. cont. *Pentamerus*, *Productus*. Not *Libera*, De Haan.
- Ligula**, Cuvier. *Lingulidae*. 1798.
 Tabl. Élém. p. 435 (not p. 634). Sole ex. *L. unguis*, L., lapsus, = *Lingula*, Brug. In index and text, passim, "*Lingule*". Not *Ligula*, Cuvier, p. 634; Humphrey; Montague, &c. (= *Lingula*, Brug.)
- Ligularius**, Dumeril. *Lingulidae*. 1806.
 Zool. Anal. p. 170; from *Ligula*, Cuvier. Dumeril had a mania for terminating all names in *arius*. (= *Lingula*, Brug.)
- Lingula**, Brugiere. *Lingulidae*. 1792.
 Enc. Méth. i, pl. 250. No diagnosis or specific name cited. The figure resembles *L. anatina*. Ib. Lam. Prodrome, 1799, p. 89. Sole ex. *Patella unguis*, Lin. = *L. anatina*, Lam. Dav. 1856, p. 243, pl. xiv, f. 24-31. Syn. *Pharetra*, Boltin, 1798.
- Lingulacea**, Blainville. *Invertebrata*. 1818.
 Diet. Sci. Naturelles, x, table, olim. Fam. Brach. cont. *Lingula*, *Terebratula*, *Orbicula*, *Sphærolites*?
- Lingulacea**, Meuke. *Lyopomata*. 1830.
 Syn. Mus. Menkeannum, ed. ii, p. 95. Fam. Brach. cont. *Lingula*. = *Lingulidae*, Gray.

- Lingulaceæ**, Menke. *Lyopomata*. 1828.
Syn. Mus. Menkeanum, ed. i, p. 56. Fam. Brach. cont. *Lingula*. Adt.
Hinds, Voy. Sulph. Zool. p. 71.
- Linguladæ**, "Bromh." Gray. *Lyopomata*. 1838.
Charlesworth's Mag. ii, p. 418. P. Z. S. 1847, p. 202. Fam. Brach.
cont. *Lingula*.
- Lingulæ**, Eichwald. *Brachiopoda*. 1829.
Zool. Spec. i, p. 272. Tribe cont. *Lingula*, *Crania*, *Orbicula*, *Terebratula*,
Obolus.
- Lingulæ**, Deshayes. *Lyopomata*. 1830.
Enc. Méth. iii, p. 553, tabl. Fam. Brach. cont. *Lingula*.
- Lingularia**, Rafinesque. *Lyopomata*. 1831.
Mon. Biv. Shells Ohio, Suppl. p. 7. Fam. Brach. cont. *Lingula*. (= *Lingulidæ*, Gray.)
- Lingularius**, (Dumeril ?) Herrmannsen. *Lingulidæ*. 1806.
Zool. Anal. p. 168, fide Herrm. (= *Lingula*, Brug.)
- Lingulella**, Salter. *Lingulidæ*. 1866.
Mem. Geol. Survey Great Brit. iii, p. 333, 1866. (Sil.) Type *L. Davisii*, McCoy. (Salter, l. c. t. ii, f. 7-12; t. iv, f. 14.) Ann. Mag. Nat.
Hist. 2d ser. viii, p. 105. Davidson, Mon. Sil. Brach. p. 56, pl. iv, f. 1-16.
- Lingulepis**, Hall. *Lingulidæ*. 1863.
16th Regent's Rep. p. 129, pl. vi, f. 15-16. Sole ex. *L. pinnaformis*, Hall,
l. c. (Sil.) = *Lingula p.* Owen, Geol. Rep. Wis., Iowa and Minn., p. 583,
pl. 1 B, f. 468.
- Lingulidæ**, Gray. *Lyopomata*. 1840.
Syn. Brit. Mus. i, p. 155. Fam. Brach. cont. *Lingula*. Id. 1848, Ann.
Mag. Nat. Hist. ii, p. 439.
- Lingulidæ**, D'Orbigny. *Lyopomata*. 1849.
Cours Élém. Pal. p. 80. Fam. Brach. cont. *Lingula*, *Obolus*. Id. Da-
vidson, 1853, p. 51, and 1856, p. 90.
- Lingulidæ**, Dall. *Lyopomata*. 1870.
Am. Journ. Conch. vi, p. 100. Fam. Brach. cont. subf. *Lingulinae*,
Obolinae.
- Lingulina**, Agassiz. *Lyopomata*. 1847.
Nom. Zool. Index, p. 610. = *Lingulidæ*, Gray, emend., not of D'Orbigny.
- Lingulina**, Giebel. *Lyopomata*. 1846.
Palæoz. Fann. p. 122. Fam. Brach. cont. *Lingula*, *Crania*.
- Lingulinæ**, Dall. *Lingulidæ*. 1870.
Am. Journ. Conch. vi, p. 100. Subf. Brach. cont. *Lingula*, *Glottidia*,
Lingulella, *Trimerella*, *Lingulepis*.

- Lingulops**, Hall. *Trimerellidæ*. 1871.
23d Regent's Rep. 1873, p. 245, pl. 13, f. 1-2. (Extras, Mar. 1871, fide Hall.) Sil. Type *L. Whitfieldi*, Hall, l. c. Id. Davids. & King. Quart. Journ. Geol. Soc. London, 1874, p. 164, pl. xix, f. 9 a, p. 165, f. 3.
- Lyopomata**, Owen. *Brachiopoda*. 1853.
Encyc. Brit. ed. viii, xv, art. Mollusca, p. 339. Order cont. the inarticulate brachiopods.
- Lyra**, Cumberland. *Terebratulidæ*. 1816.
Not formally proposed, but referred to by Sowerby in Min. Conch. 1816, t. 138, f. 4-5 (Germ. ed. p. 188). Type *L. Meadii*, Cumb. MSS. = *Terebratula lyra*, Sby. l. c. Dav. 1856, pl. vii, f. 22-24. Subg. *Terebratella*. Syn. *Trigonosemus* sp. König; *Terebrirostra*, D'Orb. Not *Lyra*, Linné, Griffiths.
- Macandrevia**, King. *Terebratulidæ*. 1859.
Proc. Dublin Univ. Zool.-Bot. Assoc. i, p. 261. Type *Terebratula cranium*, Mull. Prodr. Zool. Danica, p. 209, 1776. (Recent.) Rve. Conch. Icon. iii, f. 6. Founded on a broken specimen. Not *Macandrevia*, Gray, 1830, gen. *Porifera*. (= *Eudesia*, King.)
- Macrilia**, Rafinesque. *Brachiopoda*. 1831.
Mon. Biv. Shells Ohio, p. 7. Sect. Terebrar. cont. *Dielisma*, *Apleurotis*, *Trigorima*, *Magas*, *Obovites*.
- Magas**, Sowerby. *Terebratulidæ*. 1816.
Min. Conch. ii, p. 39. Sole ex. *M. pumila*, Sow. l. c. t. 119, f. 1-5. (Cret.) Gray, B. M. Cat. p. 99, f. 9-10.
- Magasella**, Dall. *Terebratulidæ*. 1870.
Am. Journ. Conch. vi, p. 134. Type *M. evansi*, Dav. P. Z. S. London, 1852, p. 77, pl. xiv, f. 7-9. Subg. *Terebratella*, D'Orb. (Recent.)
- Magasidæ**, D'Orbigny. *Terebratulidæ*. 1817.
Comptes Rendus, xxv, p. 268. Fam. Brach. cont. *Magas*, *Terebratulina*.
- Magasidæ**, King. *Terebratulidæ*. 1859.
Perm. Foss. p. 81. Fam. Brach. cont. *Magas*, *Bouchardia*.
- Magasina**, Gray. *Terebratulidæ*. 1853.
Brit. Mus. Cat. Brach. p. 85. Tribe Brach. cont. *Terebratella*?, *Trigonosemus*, *Magas*, *Bouchardia*, *Waltonia*?, *Morrisia*, *Megerlia*, *Kraussia*.
- Magasinæ**, H. and A. Adams. *Terebratulidæ*. 1858.
Genera Rec. Moll. ii, p. 576. Subfam. cont. *Terebratella*, *Magas*, *Bouchardia*, *Kraussia*, *Megerlia*, *Morrisia*.
- Magasinæ**, Dall. *Terebratulidæ*. 1870.
Am. Journ. Conch. vi, p. 99. Subfam. Brach. cont. *Terebratella*, *Megerlia*, *Magas*, *Ismenia*, *Magasella*.
- Majas**, Keferstein. *Terebratulidæ*. 1829.
Zeitung Geogn. p. 81; lapsus, = *Magas*, Sow. (Cret.)

- Mammina**, Dewalque. *Terebratulidæ*. 1874.
Davidson, Tert. Brach. Belgium, Geol. Mag. Decade ii, vol. i, no. 4, pl. vii, f. 10-13. (Tert.) April. Type *M. Nysti*, Dew. MS. l. c. and in Prodr. Descr. Géol. Belgique, 1868. No special diagnosis. Gen. incert. (? = *Magas*, Sow.)
- Martinia**, McCoy. *Spiriferidæ*. 1844.
Carb. Foss. Ireland, p. 128, f. 18; p. 139, f. 32. First sp. *Spirifera decora*, Phillips, Geol. Yorkshire, p. 219, pl. x, f. 9. King, Perm. Foss. 1850, p. 134, cites the above; on p. 81, cites *M. glabra*, McCoy. Syn. *Ambocoelia*, Hall.
- Meckella**, White and St. John. *Strophomenidæ*. 1870.
Trans. Chicago Acad. Sci. i, p. 120, f. 4-6. Type *Plicatula striatocostata*, Cox, = *Orthisina missouriensis*, Swallow, W. and St. J. l. c. (Dev.) (Comp. *Streptorhynchus*.)
- Meganteris**, Suess. *Terebratulidæ*. 1856.
Sitz. K. Ak. Wiss. Wien, Klasse Math. xviii, p. 51 (Dev.), t. i, f. 1-5, 16, t. iii, f. 3 a-b. Type *M. Archiaci*, Suess, l. c. Not *Meganteris* (sp.), Hall.
- Megarima**, Deshayes. *Brachiopoda*. 1832.
Enc. Méth. iii, p. 421; lapsus, = *Megorima*, Raf.
- Megarites**, Rafinesque. *Brachiopoda*. 1831.
Mon. Biv. Shells Ohio, p. 8. No ex. cited. Gen. incert.
- Megas**, Isensee. *Terebratulidæ*. 1833.
Elem. Geogn. pp. 37, 44, 46, 51; lapsus, = *Magas*, Sow.
- Megathiris**, D'Orbigny. *Terebratulidæ*. 1847.
Comptes Rendus, xxv, pp. 193, 269. No ex. cited. Pal. Franç. Terr. Cret. iv, p. 365. Ann. Sci. Nat. viii, 252. Type *Anomia detruncata*, = *A. decollata*, Chemnitz, Conchyl. Cab. viii, p. 96, t. 78, f. 705. Davidson, 1856, pl. vii, f. 35-38. (Recent.) (Mel. *Megathiris*.) Syn. *Argiope*, Desl. not Savigny.
- Megathyrina**, Dall. *Terebratulidæ*. 1870.
Am. Journ. Couch. vi, p. 100. Subfam. Brach. cont. *Megathyrina*, *Cistella*.
- Megathyrus**, Bronn. *Terebratulidæ*. 1848.
Jahrb. für Min. p. 244. = *Megathiris*, D'Orb. corrig.
- Megerlea**, Davidson. *Terebratulidæ*. 1856.
Intr. p. 129. (= *Megerlia*, King, not Rob. Des.)
- Megerlia**, King. *Terebratulidæ*. 1850.
Perm. Foss. pp. 81, 145. Type *Anomia truncata*, Lin. Reeve, Conch. Icon. xi, f. 47, a-c. (Recent.) Preoccupied by a bad genus of Diptera, Robineau Desvoidy, Essai sur les Myodaires, 1830.
- Megorima**, Rafinesque. *Brachiopoda*. 1818.
Am. Monthly Mag. iv, p. 107; name only. Journ. de Phys. t. 88, p. 427, 1819. First sp. *M. laevis*, Raf. not described. Menke, Syn. p. 96, 1830; name only. Genus incert.

Mentzelia, Quenstedt.*Spiriferidae*. 1871.

Petref. Deutschl. ii, p. 522; Atlas, pl. 54, f. 58-61. Type *Spirifer medianus*, Quenst. l. c. Handb. Petr. 1851, p. 482, t. 38, f. 33. (Lias.)

Merista, Suess.*Spiriferidae*. 1851.

Jahrb. K. K. Geol. Reichs. ii, part iv, pp. 150, 160. Type *M. herculea*, Barrande, Brach. Sil. Böhm. t. 14, f. 1, (Sil.); fide Dav. 1856, pl. ix, f. 32-35. Chenu, Man. ii, p. 217, f. 1112, 1862.

Davidson, 1856, includes *Atrypa tumida*, Dalm., among the types of *Merista*, but it appears (1861) not to be congeneric, and is type of *Meristella*, Hall, 1861; not of Hall, 1859 or 1862. Billings, Ann. Mag. Nat. Hist. xx, p. 233 et seq., proposes to retain for (1) *Athyris*, McCoy, *Atrypa tumida* as type, as has been done by Davidson in 1853. In 1852 (not 1844), McCoy had included this sp. in *Athyris*. He would preserve (2) *Spirigera*, D'Orbigny, with *S. concentrica* as type, like Davidson in 1853. Lastly, he would separate (as above) *A. tumida* from *Merista*, leaving *M. herculea*, Barr., as type. This cannot be adopted. The laws of nomenclature being framed to exclude doubt in every practicable case, it cannot be admitted that a type may be selected for a genus which the author in his original construction of the genus did not specifically include in it. Any other course would open the door to a host of misconceptions. Therefore, Billings's proposition cannot be entertained:

First, because *A. tumida* was not included by McCoy in his original description and list of Athyrides;

Secondly, because *Spirigera*, founded on what was properly taken to be McCoy's type of 1844, was avowedly intended to supersede *Athyris* as an ineligible name; though, in the latter case, *Seminula* or *Actinoconchus* would have had prior claims for adoption;

Lastly, because Hall, in 1860, had already made *tumida* the type, or included it among his types of *Meristella*, positively characterized for the first time in that year.

There is therefore no reason for disturbing Mr. Davidson's judicious and widely adopted arrangement of 1856.

Meristella, Hall.*Spiriferidae*. 1859.

12th Regent's Rep. (Oct. 1859), p. 78, note. No diagnosis; sole cited, *Atrypa naviformis*, Hall, Pal. N. York, i, pl. xxiv, f. 1 a-c. Ib. ii, p. 76. (Sil.) Comp. *Meristina*, Hall.

Meristella, Hall.*Spiriferidae.***1860.
1861.**

13th Reg. Rep. p. 74, (Dec. '60 or Jan. '61). *Atrypa tumida*, Dalm. (Dav. Mon. Sil. Brach. p. 109, pl. xi, f. 1-13), mentioned, in preliminary remarks, as belonging to the new group. First sp. cited in list of American examples, *M. larvis*, Hall, l. c. (cf. *Charionella*).

As *Atrypa tumida*, Dalm., which has unwisely been included in *Athyris* and *Merista* (and which, for reasons previously given, cannot be said to be typical of either), if distinct from these forms as originally typified, remains free to be described generically, it would seem as if this name, as here applied, might stand, unless objection be raised from its previous application to *Atrypa naviformis*.

Meristella, Hall, (olim) MSS.**1862.**

15th Regent's Report, pp. 179, 180. Extra copies, pp. 151-2, Decr 1862. Types cited, (1) *Atrypa quadricostata*, Hall, Geol. Rep. 4th Dist. N. York, p. 223, f. 2; (2) *Atrypa multicosta*, Hall, 15th Reg. Rep. p. 181, f. 14, 15, and p. 190; extra copies, pp. 153, 162; (3) *A. mesocostalis*, Hall, Rep. l. c. p. 191; extras, p. 163, f. 1 a-c. (= *Leiorhynchus*, Hall, 1860-1.)

It appears, from a note of Professor Hall in the 15th Regent's Rep. p. 148 (extra copies), that during the long delay which took place between the presentation and the printing (partially) of the 13th Report and its final publication, some changes were considered desirable by him, and accordingly were made, in the printing-office, some time before its publication. Some proof-sheets having come into the possession of various persons before the above changes were made, and before the report had actually been published, and afterward the discrepancies between said proof-sheets and the final issue of the report having excited comment, Professor Hall, in the 15th Report, as above, reprinted the matter as it originally stood, to avoid misconception. This publication may then be considered as void, and standing in the light of an erratum; Professor Hall's final views being apparently those of the 13th Report as published. It will be observed that the types above quoted are those published as the types of *Leiorhynchus*, Hall, in the 13th Report, other types being there assigned to *Meristella*. In this connection, see Professor Hall's note, 15th Rep. (extras, p. 148), above cited, and Silliman's Am. Journ. Sci. and Arts. xxxi, p. 292, Mar. 1861, and xxxii, p. 430.

- Meristina**, Hall. *Spiriferidae*. 1867.
Notice Pal. N. York, vol. iv, Mar. 1867, p. 157, cut. Pal. N. Y. vol. iv, p. 299, cut. Sole ex. *M. maria*, Hall, l. c. (Sil.) (?= *Meristella*, Hall, 1859.)
- Mesopygia**, Quenstedt. *Arthropomata*. 1871.
Petref. Deutschl. ii, p. 21. Substitute proposed for *Apygia*, Bronn.
- Mesotreta**, Kutorga. *Siphonotretidae*? 1848.
Verh. Kais. Min. Ges. St. Petersburg f. 1847, p. 271, t. vii, f. 4 a-c.
Type *Siphonotreta tentorium*, Kut. l. c. (Sil.)
- Monobolina**, Salter. *Obolidae*. 1865.
Mem. Geol. Surv. Great Brit. iii, p. 334. (Sil.) Type *M. plumbea*, Salter, Siluria, ed. ii, p. 50, Foss. pl. 8, f. 1, 1859. Dav. Mon. Sil. Brach. pl. iv, f. 20, 27, p. 61. Subgen. *Obolella*, Bill.
- Monomerella**, Billings. *Trimerellidae*. 1871.
Canadian Nat. new ser. vi, p. 220, Dec. 29, 1871. Type *M. prisca*, Bill. l. c. p. 221. Dav. & King, Quart. Journ. Geol. Soc. Lond. May, 1874, p. 156, pl. xvii, f. 5-8. (Sil.)
- Morrisia**, Davidson. *Terebratulidae*. 1852.
Ann. Mag. Nat. Hist. May, 1852, p. 371. (Rec.) Type *Terebratula anomioides*, Scacchi, in Philippi, Moll. Sicil. ii, p. 69, pl. xviii, f. 9, 1844. (= *Platidia*, Costa.)
- Musculus**, Quenstedt. *Terebratulidae*. 1871.
Petref. Deutschl. ii, p. 27, 384; Atlas, pl. 48, f. 70-74; gen. Epithyrid. (Cret.) Type *Terebratula biplicata* var. *acuta*, von Buch, Abhandl. Berliner Akad. 1833, p. 128; Quenst. l. c. = *Musculus anomus*, Sch. Mus. dil. p. 75, 1716. (Non-binomial.) Not *Musculus*, Klein, Raf. and others. (= *Terebratula*, Mull.)
- Notremidia**, Rafinesque. (*Incertæ sedis*.) 1818.
Am. Monthly Mag. iv, p. 356. Subfamily including *Orbicula* and an imaginary genus *Notrema*.
- Nucleata**, Quenstedt. *Terebratulidae*. 1871.
Petref. Deutschl. ii, p. 27, t. 47, f. 93-98. Sect. *Epithyrida*. Type *Terebratula nucleata*, Schlotheim, Petref. p. 281, 1820; Quenst. l. c. (= *Terebratula*, Müller, *sensu stricto*.)
- Nucleospira**, Hall. *Spiriferidae*. 1859.
12th Regent's Rep. (Oct.), p. 23-25. Type *N. ventricosa*, Hall, l. c. p. 25-6, f. 1-8; Pal. N. York, iii, p. 219, 1859. Same type, pl. xiv, f. 1, pl. xxviii^b, f. 2-9. (Sil.)
- Nummulus**, Waller. *Craniidae*. 1778.
Syst. Min. ii, p. 500. Non-binomial. (= *Crania*, Retz.)
- Namulus**, Agassiz. *Craniidae*. 1846.
Nom. Zool. fasc. ix, 1846, p. 60. (= *Nummulus*, Wall.)
- Obolella**, Billings. *Obolidae*. 1861.
New sp. L. Sil. Foss. i, pp. 6-7, f. 7 a-d. Type *O. chromatica*, Bill. i. c. (December).

- Obolellina**, Billings. *Trimerellidæ*. 1871.
Canadian Nat. new ser. vi, p. 220, Dec. (Sil.) Type *Obolus gallensis*, Billings, l. c. p. 222. Pal. Geol. Surv. Canada, p. 168, f. 161, Jan. 1862. (= *Trimerella*, B.)
- Obolidæ**, King. *Lyopomata*. 1846.
Ann. Mag. Nat. Hist. xviii, p. 28. Fam. Brach. cont. *Obolus*.
- Obolina**, Dall. *Lingulidæ*. 1870.
Am. Journ. Conch. vi, p. 100. Subfam. Brach. cont. *Obolus*, *Obolella*, *Monobolina*, *Spondylobolus*.
- Obolus**, Eichwald. *Obolidæ*. 1829.
Zool. Spec. i, p. 274. (Sil.) Type *O. apollinis*, Eich., Schl. sp. Dav. 1853, p. 136, pl. ix, f. 280-284. Syn. *Aulonotreta*, pars, Kut.; *Ungula*, Pander; *Ungulites*, Bronn.
- Obovites**, Rafinesque. *Brachiopoda*. 1831.
Mon. Biv. Shells Ohio R. p. 7. No ex. cited. Gen. incert.
- Obolus**, Quenstedt. *Obolidæ*. 1871.
Petref. Deutschl. ii, p. 732; lapsus, = *Obolus*, Eichw.
- Onychites**, Mercati. *Brachiopoda*. 1717.
Met. Vatic. p. 330 (non-binomial), and subsequent writers, for a group of brachiopods with deeply incurved umbones, like *Stringocephalus*, *Gypidia*, and some *Rhynchonellæ*.
- Orbicella**, D'Orbigny. *Discinidæ*. 1847.
Comptes Rendus, xxv, p. 269. No ex. cited. Ann. Sci. Nat. xiii, 1850, p. 350. No ex. cited. Prodr. Pal. Strat. 1849, p. 20. No type selected, first two sp. cited as of "D'Orb. 1847". 1st sp. *O. Buckii*, Verneuil, Murch. Geol. Russ. Ural, ii, p. 288, t. 19, f. 1. 2d sp. *O. punctata*, Sowerby, in Murchison's Siluria (ed. iii), p. 212, f. (35) 1, pl. v, f. 17. (L. Sil.) Dav. Mon. Sil. Brach. p. 69, pl. vi, f. 9. 9th (last) sp. cited *O. terminalis*, "D'Orb. 1848", Conrad, in Emmons, Geol. N. York, iv, p. 395, f. 4, 1842. Dav. 1856, xiv, f. 4-7. In the absence of other information, *O. Buckii* may be taken as the type. (= *Trematis*, Sharpe.)
- Orbicula**, Cuvier. *Craniidæ*. 1798.
Tabl. Élé. d'Hist. Nat. p. 435. Type *Patella anomala*, Mull. = *Crania an.* Dav. 1856, pl. xiii, f. 24, 32, 33, 35, 36. (Recent.) Lamarck, Prodr. p. 83, 1799. Type *O. norvegica*, Lam. non Sow. = *Crania anomala*. Ib. Syst. An. s. Vert. 1801, p. 140, same type. (= *Crania*, Retz.)
- Orbicula**, Sowerby. *Discinidæ*. 1830.
Min. Conch. vi, p. 4, pl. 506. Ex. *O. reflexa*, Sow. l. c. G. B. Sowerby, Conch. Man. ed. ii, p. 209, 1842. Thes. Conch. i, p. 365, 1847. Not *Orbicula*, Cuv. (= *Discina*, Lam.)
- Orbiculacea**, Anton. *Lyopomata*. 1839.
Verzeichn. p. 21. Fam. Brach. cont. *Orbicula*.
- Orbiculæ**, Deshayes. *Lyopomata*. 1830.
Encyc. Méth. iii, p. 553, tabl. Fam. Brach. cont. *Orbicula*.

Orbicularius, Dumeril.*Craniida*. 1806.Zool. Analyt. p. 168. (= *Orbicula*, Cuv.)**Orbiculidæ**, M'Coy.*Lyopomata*. 1844.Carb. Foss. Ireland, p. 103. Fam. Brach. cont. *Orbicula*. Adt. King, Ann. Mag. Nat. Hist. xviii, p. 28, 1846. (= *Discinidæ*.)**Orbiculidæ**, D'Orbigny.*Lyopomata*. 1849.Cours Élém. Pal. p. 80. Fam. Brach. cont. *Siphonotreta*, *Orbicella*, *Orbiculoidea*, *Orbicula*.**Orbiculina**, Agassiz.*Lyopomata*. 1847.Nom. Zool. Index, p. 757. = *Orbiculidæ*, M'Coy corrig. Not *Orbiculina*, Lam. gen. Rhizop.**Orbiculoidea**, D'Orbigny.*Discinidæ*. 1847.

Comptes Rendus, xxv, p. 269. No ex. cited. Ann. Sci. Nat. xiii, 1850, p. 351. No ex. cited. Prodr. Pal. Strat. 1849 (Sil.), p. 21. 1st sp. *O. Morrisii*, "D'Orb. 1847", Dav. Mon. Sil. Brach. p. 65, pl. vii, f. 10-12. Two other sp. cited as of "D'Orb. 1848". It would appear as if *O. Morrisii* must be considered as the type. Dav. 1856, pl. xiv, f. 1-3, cites *O. elliptica*, Kutorga sp. (*Schizotreta*) as type or example of both *Orbiculoidea* and *Schizotreta*, as also in 1853, p. 129, t. ix, f. 253-255. It is, however, only the type of the latter, though both may be congeneric. (Comp. *Schizotreta*, Kut.)

Orthothrix, Davidson.*Productidæ*. 1856.Intr. Expl. pl. xii, f. 27; lapsus = *Orthothrix*, Geinitz.**Orthambonites**, Pander.*Strophomenidæ*. 1830.

Beitr. Geogn. Russ. Reiches, p. 80, t. iii, f. 7; xxviii, f. 18, generic diagrams. 1st sp. p. 81, t. xxii, f. 1, (Sil.) *O. transversa*, Pander, l. c., which with eleven of Pander's eighteen nominal species is referred by Bronn, Ind. Pal. iii, p. 852, to *Orthis calligramma*, Dalman, Ter. p. 28, t. 2, f. 2. See *Orthis*. Syn. *Schizophoria*, King. (= *Orthis*, Davidson.)

Orthidæ, Woodward.*Arthropomata*. 1852.Man. Rec. and Foss. Shells, p. 229. Fam. Brach. cont. genera *Orthis*, *Strophomena*, *Davidsonia*, *Calceola*.**Orthis**, Dalman.*Strophomenidæ*. 1828.

Kongl. Vet. Acad. Handl. f. 1827, pp. 93, 96. 1st sp. (queried by Dalm.), *O. ? pecten*, Wahl. sp. Act. Upsal. viii, p. 66; Dalm. l. c. p. 110, t. 1, f. 6. 2d sp. (also queried), *O. ? striatella*, Dalm. l. c. p. 111, t. 1, f. 5; 3d (not regarded as typical by Dav.), *O. zonata*, Dalm. l. c. p. 111, t. ii, f. 1 a-e (not = *O. adscendens*, Pander); 4th sp. *O. callactis*, Dalm. l. c. p. 112, t. ii, f. 2; 5th sp. *O. calligramma*, Dalm. l. c. p. 114, t. ii, f. 3 a-d; Dav. 1853, t. vii, f. 127. This and the 4th sp. are taken as typical by Davidson. Syn. *Schizophoria*, King; *Orthambonites*, Pander. Not *Orthis*, Mke.

Orthis, Menke.*Terebratulidæ*. 1830.

Syn. Mus. Menkeanum, ed. ii, p. 96. Sole ex. *Anomia truncata*, Lin. sp. Dav. 1856, pl. vii, f. 9-12. Id. Philippi, Moll. Sicil. ii, p. 69; i, p. 95, t. vi, f. 12. Not congeneric with any of Dalman's species. (= *Megerlia*, King.)

Orthis, King.*Strophomenidae*. **1850.**

Perm. Foss. pp. 103-105. Type *Anomites pecten*, Wahl., Dalman's 1st but queried sp. of *Orthis*. Dav. 1856, pl. xi, f. 42. Not *Orthis*, Davidson, Mke. but = *Strophomena*, Bl. sp.

Orthis, Davidson.*Strophomenidae*. **1853.**

Intr. p. 101, pl. vii, f. 127. Types *O. calligramma*, Dalm. Dav. l. c. and *O. elegantula*, Dalm. Dav. l. c. pl. viii, f. 140. Ibid. 1856, p. 194. Includes *Orthambonites*, *Platystrophia*, *Dicaelosia*, and *Schizophoria*. (= *Orthis*, Dalm. em. not of King, Menke, or Philippi.)

Orthisidae, D'Orbigny.*Arthropomata*. **1849.**

Cours Élém. Pal. p. 80. Fam. Brach. cont. *Strophomena*, *Orthis*, *Orthisina*.

Orthisina, D'Orbigny.*Strophomenidae*. **1847.**

Comptes Rendus, xxv, p. 267. No ex. cited. Ann. Sci. Nat. viii, p. 268, t. 8, f. 7 (probably *anomala*). No sp. named. Id. xiii, 1850, p. 319. No type specified. Three species: 1st, *O. anomala*, Schloth. sp. Dav. 1853, t. 8, f. 150, 151; 2d, *O. adscendens*, Pander sp.; 3d, *O. Verneuilii*, D'Orbigny (Eichwald sp.). Prodr. Pal. Strat. i, p. 18. No type cited. Three sp. named: 1st, *Verneuilii*; 2d, *anomala*; 3d, *adscendens*. Cours Élém. Pal. 1852, ii, p. 84. Sole ex. cited, *O. Verneuilii*, l. c. f. 243. Eichwald, Urwelt, ii, p. 51, t. 2, f. 3-5. Dav. 1856, t. xi, f. 23. This should probably be taken as the type. Quenstedt considers *anomala* and *adscendens* conspecific. (= *Klitambonites*, Pand.)

Orthisina, King.*Strophomenidae*. **1850.**

Perm. Foss. p. 105. Ex. *Gonambonites plana*, Pand. Dav. 1856, pl. xi, f. 25. Ibid. 1853, pl. viii, f. 153, 154.

Orthisina, Davidson.*Strophomenidae*. **1853.**

Intr. p. 104, pl. viii, f. 149. Takes as type *Klitambonites adscendens*, Pander, l. c. Ibid. 1856, p. 198, pl. xi, f. 24, 26. (= *Klitambonites*, P.)

Orthonota, Emmons.*Acephala*. **1842.**

Genus supposed by Herrmannsen, Ind. Mal. ii, p. 165, to belong to the Brachiopoda. (Lapsus, = *Orthonota*, Conrad.)

Orthotetes, Oken.*Strophomenidae*. **1831.**

Isis, p. 232, as of Fischer de Waldheim. Agassiz, Nom. Zool. Index, p. 764, 1847. King, Ann. Mag. Nat. Hist. xviii, 1846, p. 37, note, cites *Strophomena pecten*, Wahl., as the apparent type. (= *Orthothetes*, Evans.)

Orthotheles, D'Orbigny.*Strophomenidae*. **1850.**

Pál. Franç. Terr. Cret. iv, p. 340; lapsus (= *Orthothetes*, Evans.)

Orthothetes, (Evans, MS.) Fischer.*(Incerta sedis)*. **1829.**

Bull. Soc. Imp. Nat. Moscou, i, p. 375. No ex. cited or figured. Generic description insufficient to be recognizable. Stated to be related to *Placma* and *Pedum*. (Gen. incert.)

Orthothetes, Fischer de Waldheim.*Strophomenidae*. 1837.

Oryct. Gouv. Moscou, p. 133, t. xx, f. 4 a-c. No specific name applied. According to Bronn, the figure represents *Orthis arachnoidea*, Verneuil, Geol. Russ. Ural Mts. ii, p. 196, t. x, f. 18; xi, f. 1, which, according to Davidson, is *Spirifera crenistria*, Phillips, Geol. Yorkshire, ii, 1836, p. 216, pl. ix, f. 6, = *Streptorhynchus crenistria*, Dav. Mon. Carb. Brach. pp. 124, 228, and Mon. Dev. Brach. p. 81. Fischer again introduces the name in Bull. l. c. 1850, p. 23, pl. x, f. 3, with the species this time named *O. radiata*, Fischer, = *Streptorhynchus umbraculum*, Dav. Mon. Dev. Brach. p. 76. Syn. *Streptorhynchus*, King. (= *Hipparionyx*, Vanuxem.)

Orthothrix, Geinitz.*Productidae*. 1847.

Bull. Soc. Imp. Nat. Moscou, xx, p. 84. Type *Strophalosia excarata*, Geinitz, sp. Dav. 1856, pl. xii, f. 27-29. Cf. Geinitz, Zechst. p. 48, 1848, and Verneuil, Bull. Soc. Géol. France, v, p. 300, 1848. (= *Strophalosia*, King.)

Orthotoma, Quenstedt.*Terebratulidae*. 1871.

Petref. Deutschl. ii, p. 315, pl. 45, f. 138-142. Subg. *Terebratula*. (Mid. Lias.) Type *Ter. Heyseana*, Roemer, Verst. Nordl. Ool. 1836, p. 35, t. 12, f. 7.

Orthotrix, Auctt.*Productidae*.

Lapsus; cf. *Orthothrix*, Geinitz.

Ostracites, Llhwyd.*Invertebrata*. 1699.

Lith. Brit. Ichn. and other non-binomial authors. Genus incert. Included fossil Pectinides, Spondyli, Ostreae, and Brachiopoda.

Ostreopectinites, Auctt.*Invertebrata*.

Used by early non-binomial authors to include various ribbed brachiopods, *Anomia* and *Ostrea* sp. foss.

Oxyrhynchus, Llhwyd.*Rhynchonellidae*. 1699.

Lith. Brit. Ichn. p. 34, non-binomial. Quenstedt, Petref. Deutschl. ii, 1871, pp. 29, 34. (= *Rhynchonella*, Fischer, not *Oxyrhynchus*, Aristotle.)

Pachiloma, Rafinesque.*Brachiopoda*. 1831.

Mon. Biv. Shells Ohio R. p. 8. No ex. cited. Gen. incert.

Pachyloma, Herrmannsen.*Brachiopoda*. 1848.

Ind. Gen. Mal. ii, p. 186. Paetel, Fam. u. Gatt. Moll. p. 149, 1875; lapsus, = *Pachiloma*, Raf.

Pachyrhynchus, King.*Terebratulidae*. 1850.

Perm. Foss. p. 70. (Recent.) Type *Terebratula rosca*, Mawe. Sow. Gen. f. 4, Dav. 1856, pl. vii, f. 25-8. (= *Bouchardia*, Dav.)

Palaeocrania, Quenstedt.*Craniidae*. 1871.

Petref. Deutschl. ii, p. 688, t. 61, f. 98. (Sil.) Sole ex. *Orbicula anti-quissima*, Eichw. Leth. Ross. 1860, i, p. 909. (Cf. *Pseudocrania*, McCoy.)

Palliobranchiata, Blainville.*Invertebrata*. 1824.

Dict. Sci. Nat. xxxii, p. 298. Class Moll. cont. the Brachiopoda and some genera of *Acephala*.

- Palliobranchiata**, King. *Brachiopoda*. 1846.
Ann. Mag. Nat. Hist. xviii, p. 26. Class Moll. cont. *Obolidae*, *Lingulidae*, *Orbiculidae*, *Craniidae*, *Calceolidae*, *Strophomenidae*, *Productidae*, *Terebratulidae*, *Spiriferidae*, *Thecididae*.
- Paracyclas**, Hall. *Acephala*. 1843.
Geol. Rep. Fourth Distr. N. York, p. 171. Erroneously referred by Hermannsen, Ind. Gen. Mal. ii, p. 200, to the Brachiopoda. (Gen. *Lucinidarum*.)
- Pectinites**, Aldrovandus. *Invertebrata*. 1468.
Mus. Met. &c. Contained fossil pectens, with which pectiniform brachiopods were often confounded.
- Pectunculi**, Lister. *Invertebrata*. 1687.
And subsequent non-binomial authors. Contained fossil sp. of brachiopods among other things. Cf. *Pectunculites*.
- Pectunculites**, Lister. *Invertebrata*. 1687.
Hist. an. Angl. p. 245. Gen. conch. biv. fos. cont. sp. of brachiopods. Non-binomial. (Cf. *Pectinites*.)
- Pectunculus**, Quenstedt. *Arthropomata*. 1871.
Petref. Deutschl. ii, p. 27, gen. *Hypothyridarum*; p. 3 mentions *P. ferreolus*, Gesner, 1565, De fig. lapid. p. 166. Non-binomial. =? *Terebratula rimosa*, Quenst. Handb. Petref. 1851, p. 447. Not *Pectunculus*, Lam.
- Pedunculata**, Berth. *Brachiopoda*. 1827.
Germ. ed. Latreille, Fam. Nat. p. 196. Order cont. fam. *Æquivalvia*, *Inquiralria*. (= *Pédoncules*, Latr.)
- Pedunculata**, Fleming. *Brachiopoda*. 1828.
Brit. An. pp. 225, 367. Fam. Brach. cont. *Lingula*, *Terebratula*, *Magas*, *Spirifer*.
- Pedoncules**, Latreille. *Brachiopoda*. 1825.
Fam. Nat. Règne An.* Ord. Brach. = *Pedunculata*, Berth.
- Pentagonia**, Cozzens. *Spiriferidae*. 1846.
Ann. Lye. Nat. Hist. N. York, iv, p. 158, pl. x, f. 3 a-b; read Dec. 8th, 1845. Type *P. Peersii*, Cozzens, l. c. = *Atrypa unisulcata*, Conrad, Pal. N. Y., iv, p. 309, pl. 50. Comp. *Goniococlia*, Hall.
- Pentamerella**, Hall. *Pentameride*. 1867.
Notice Pal. N. York, vol. iv, March, p. 163. Pal. N. York, iv, pp. 373, 375. Type *Atrypa arata*, Conrad. An. Rep. Geol. N. York, 1841, p. 55. Hall, l. c. 1867, p. 375, pl. 58, f. 1-21.
- Pentameridæ**, McCoy. *Arthropomata*. 1844.
Carb. foss. Ireland, p. 103. Fam. Brach. cont. *Pentamerus*.
- Pentameridæ**, Hall. *Arthropomata*. 1867.
Notice of Pal. N. Y., vol. iv, p. 19. Fam. brach. cont. *Pentamerus*, *Pentamerella*, *Stricklandinia*, *Gypidula*, *Anastrophia*, *Amphigenia*, *Camurophoria*, ?*Triplexia*, ?*Gypidia*, ?*Camarella* sp.

- Pentameroida**, Agassiz. *Arthropomata*. 1847.
Nom. Zool. Index, p. 805, = *Pentamerida*, McCoy corrig.
- Pentamerus**, Sowerby. *Pentamerida*. 1813.
Min. Conch. i (Germ. ed. p. 48), pl. 28, f. 1, 1813. 1st sp. *P. Knightii*, Sowerby, l. c.; Dav. 1856, pl. x, f. 33-34. Other sp. *P. lavis*, Sow. l. c. f. 2; *P. Aylesfordi*, Sow. l. c. t. 28, f. 3; t. 29. (Cf. *Conchidium*, Lin.)
- Pentastera**, Hermannsen. *Pentamerida*. 1818.
Index Gen. Mal. ii, p. 231, = *Pentastère*, Bl. = *Pentamerus*, Sowerby.
- Pentastère**, Blainville. *Pentamerida*. 1821.
Diet. Sci. Nat. xxxii, p. 301. Ibid. Man. Mal. 1825, p. 511. Vern. pro *Pentamerus*, Sowerby.
- Perforata**, Giebel. *Arthropomata*. 1852.
Allgem. Pal. p. 78. Fam. Brach. = *Orthisida*, D'Orbigny.
- Peridiolithus**, Huppsch. *Brachiopoda*. 1768.
Nene Entdeck. p. 144; non-binomial. ? = *Orthis*, sp.
- Pharetra**, Boltén. *Lingulida*. 1798.
Mus. Bolt., (ed. 1819, p. 111). Sole ex. *P. monoculoides*, Bolt. l. c. No description or figure of genus or species. = *Lingula anatina*, Lam. Hist. vi. 1819, p. 258. (= *Lingula*, Brug.)
- Pholidops**, Hall. *Cranida*. 1860.
13th Regent's Rep. p. 92; 15th do. p. 195. 1st sp. *P. squamiformis*, Hall, Pal. N. York, iii, pl. 108 B, f. 6 a-b. In notice of Pal. N. Y. vol. iv, Mar. 1867, by a MS. correction as distributed, this genus is said to be a synonym of *Pseudocrania*, McCoy, 1859. In Pal. N. Y. vol. iv, p. 413, *Crania antiquissima*, Eichwald, Verneuil, Geol. Rus. Ural. ii, pl. i, f. 12 a-c, is said to be a *Pholidops*, but was cited by McCoy as his first of two species of *Pseudocrania*. McCoy's *P. divaricata* is said to be of a different type. Syn. *Palaeocrania*, Quenstedt, 1871. (Sil.) (= *Pseudocrania*, McCoy.)
- Pilolithus**, Beuth. *Calceolida*. 1776.
Julie et Mont. subterr. p. 150. Non-binomial. (= *Calceola*, Lam.)
- Plachiloma**, Ferussac. *Brachiopoda*. 1835.
Bull. Zool. p. 23; lapsus, = *Pachiloma*, Raf.
- Placunea**, Rafinesque. *Invertebrata*. 1815.
Analyse Nat. p. 148. Fam. cont. *Cranicella*, Raf. (= *Les Ostracées*, Lam.)
- Platidia**, Costa. *Terebratulida*. 1852.
Fauna del Regno Napoli, p. 47, January. (Recent.) Type *Terebratula anomioides*, Scacchi, in Philippi, Moll. Sicil. ii, p. 69, pl. xviii, f. 9. Syn. *Morrisia*, Dav.
- Platidiinae**, Dall. *Terebratulida*. 1870.
Am. Journ. Conch. vi, p. 100. Subfam. cont. *Platidia*.

- Platilia**, Rafinesque. *Brachiopoda*. 1831.
Mon. Biv. Shells Ohio R. p. 7. Sect. Terebrariorum cont. *Flatilites*,
Pleurinea, *Pachiloma*, *Strophomenes*, *Pleuranisis*.
- Platilites**, Rafinesque. *Brachiopoda*. 1831.
Mon. Biv. Shells Ohio, p. 8. No ex. cited. Genus incert.
- Platistrophia**, Quenstedt. *Strophomenidae*. 1871.
Petref. Deutschl. ii, p. 735; lapsus, = *Platystrophia*, King.
- Platystrophia**, King. *Strophomenidae*. 1850.
Perm. Foss. p. 106. (Sil.) Type *Orthis biforata*, Schloth. Dav. 1853,
p. 101, pl. vii, f. 146-148. (= *Orthis*, Dav.)
- Plectambonites**, Pander. *Strophomenidae*. 1830.
Beitr. Geognos. Russ. Reiches, p. 90, t. iii, f. 8, 16; t. xxviii, f. 19, generic
figures. 1st sp. p. 90, t. xix, f. 1, *P. planissima*, Pander, l. c. Sil. (which
with *P. convexa*, Pander, l. c. p. 91, t. xix, f. 5, and other of Pander's sp.
is referred by Brown, Ind. Pal. iii, p. 995, to "*Leptaena*" *convexa*, Murch.
Verneuil and Keys. Geol. Russia, ii, p. 232, t. 15, f. 5). Generic figure
t. iii, f. 8, appears to represent a *Strophomena* of the *rhomboidalis* type.
Adt. Shaler, 1865, Bull. Mus. Comp. Zool. i, p. 64: 1st sp. *P. glabra*,
Shaler, l. c. (Sil.) Syn. *Leptagonia*, McCoy; *Leptaena*, King; *Strophomena*,
sp. Dav.; *Leptaena*, sp. Dahman.
- Pleuranisis**, Rafinesque. *Brachiopoda*. 1831.
Mon. Biv. Shells Ohio, p. 8. No ex. cited. Genus incert.
- Pleurecterites**, Bronn. (*Incertae sedis*). ? 1848.
Pal. Coll. p. 118. Herrmannsen, Ind. Gen. Mal. ii, p. 391. = *Pleurecte-*
rites, Raf. corrig. Cf. *Pleurecterites*.
- Pleurecterites**, Rafinesque. *Invertebrata*. 1832.
Atlantic Journal, iv, p. 142, cuts.: 1st sp. *P. lateristria*, Raf. f. 2
(apparently a fossil coral); 2d sp. *P. obliqua*, Raf. f. 3, p. 143 (= *Tri-*
gonia, sp.). Genus worthless; referred by Agassiz, Nom. Zool. Index, p.
860, 1847, to the Brachiopoda.
- Pleurinea**, Rafinesque. *Brachiopoda*. 1820.
Ann. Gen. Sci. Phys. Bruxelles, v, p. 232; name cited; no description.
Mon. Biv. Sh. Ohio, p. 8; diagn.; no ex. cited. Genus incert.
- Pleuropygia**, Bronn. *Brachiopoda*. 1862.
Klass. u. Ordn. Thier. iii, 1 Ste Abth. p. 301. Order cont. the inarticu-
lated brachiopods. (= *Lyopomata*, Owen.)
- Poleteria**, Rafinesque. *Invertebrata*. 1815.
Analyse Nat. p. 148. Order cont. among other things the family
Brachiopca.
- Polymaria**, "Deshayes", King. *Invertebrata*. 1850.
Perm. Foss. p. 67, in synonymy. ? lapsus pro *Polymyaria*. (= *Brachi-*
opoda, Cuv.)

Porambonites, Pander.*Porambonitidae.* 1830.

Beitr. Geogn. Russ. Reiches, p. 95, t. iii, f. 9: generic figure; t. xxviii, f. 21, 25; 1st sp. p. 95, t. xvi A, f. 12, (Sil.) *P. intermedia*, Pander, l. c. Eight of Pander's species are referred by Broun, Ind. Pal. iii, p. 1029, to *P. equirostris*, Schlotheim sp. = *Terebratulites equirostris*, Schloth. Petref. i, p. 282, 1820, which is taken as type by Dav. 1853, p. 99, t. vii, f. 120-122, and 1856, p. 192, pl. x, f. 37-39. Cf. Dav. Geol. Mag. Decade ii, vol. i, Feb. 1874, t. iii. Syn. *Isorhynchus*, King; *Priambonites*, Agassiz.

Porambonitidae, Davidson.*Arthropomata.* 1853.

Intr. p. 51. Fam. Brach. cont. *Porambonites*. Ibid. 1856 (olim).

Priambonites, Agassiz.*Strophomenidae.* 1847.

Nom. Zool. Fasc. ix, 1846. Index, p. 886, 1847. Idem. Hermannsen, Ind. Gen. Mal. ii, p. 331, and Paetel, Fam. u. Gatt. Moll. p. 471; lapsus, = *Porambonites*, Pander.

Priomites, Agassiz.*Strophomenidae.* 1847.

Nom. Zool. Index, p. 888. Idem. Herrn. l. c. ii, p. 332, 1848; lapsus, = *Priomites*, Pander, not Illiger.

Producta, G. B. Sowerby.*Productidae.* 1825.

Genera of Shells, fasc. 21. (= *Productus*, Sow.)

Producta, McCoy.*Productidae.* 1844.

Carb. Foss. Ireland, p. 105, f. 9. First sp. *Productus aculeatus*, Sow. Min. Couch, t. 65, f. 7-8, 1813.

Productella, Hall,*Productidae.* 1867.

Notice of Pal. N. York, vol. iv, Mar. p. 149. Pal. N. York, iv, p. 153. First sp. *P. subaculeatus*, Murch. Bull. Soc. Géol. France, xi, p. 255, pl. ii, f. 9 a-c, 1840. Hall, l. c. p. 154, pl. xxiii.

Producti, Deshayes.*Arthropomata.* 1830.

Encycl. Méth. iii, p. 553, tabl. Fam. Brach. cont. *Productus*. (= *Productidae*, Dav.)

Productidae, Gray.*Invertebrata.* 1840.

Synops. Brit. Mns. i, p. 155. Fam. Brach. cont. *Productus*, *Culecola*.

Productidae, King.*Arthropomata.* 1846.

Ann. Mag. Nat. Hist. xviii, p. 28. Fam. Brach. cont. *Productus*, *Strophalosia*.

Productidae, D'Orbigny.*Arthropomata.* 1847.

Comptes Rendus, xxv, p. 267. Fam. Brach. cont. *Productus*, *Chonetes*, *Leptagonia*, *Leptæna*.

Productidae, Gray.*Invertebrata.* 1848.

Ann. Mag. Nat. Hist. ii, p. 438. Fam. Brach. cont. *Productus*, *Strophalosia*, *Chonetes*, *Leptæna*, *Orthis*, *Strophonema*, *Calceola*.

Productidae, D'Orbigny.*Arthropomata.* 1849.

Cours Élém. Pal. p. 80. Fam. Brach. cont. *Productus*, *Chonetes*, *Leptæna*.

Productidæ, Davidson.*Arthropomata.* **1853.**

Intr. p. 51. Fam. brach. cont. *Chonetes*, *Strophalosia*, *Productus*, (*Aulosteges*?). Ibid. 1856, p. 90.

Productidæ, Quenstedt.*Arthropomata.* **1871.**

Petref. Deutschl. ii, p. 27. *Mesopygia*, sect. iii, cont. subsect. *Diplothyridæ*, *Syphnothyridæ*.

Productina, Giebel.*Arthropomata.* **1846.**

Allgem. Pal.* Fam. Brach. = *Productidæ*, D'Orbigny. Ibid. Agassiz, Nom. Zool. Index, p. 892, 1847.

Productus, Sowerby.*Productidæ.* **1812.**
1814.

Min. Conch. i, p. 153, t. 68; do. iv, p. 15, t. 317, f. 2-4, 1823. Type *P. martini*, Sow. l. c. = *Anomites semireticulatus*, Mart. 1809, Petref. Derb. p. 7, pl. xxxii, f. 1-2, + *A. productus*, Mart. l. c. p. 9, pl. xxii, f. 1-3. Adt. Dav. 1856, *P. martini*, Sow. pl. xii, f. 11; Koninek, Mou. *Productus*, 1847, p. 83, pl. viii, f. 1 a-h; pl. ix, f. 1 a-m; pl. x, f. 1 a-d.

Pronites, Pander.*Strophomenidæ.* **1830.**

Beitr. Geogn. Rus. Reich. p. 71, sect. *Klitambonites*; 1st sp. *P. ascendens*, Pander, l. c. t. xvii, f. 6. (Sil.) Dav. 1856, pl. xi, f. 24, 26, = type of *Klitambonites*. Not *Pronites*, Illiger, 1811, gen. Avium. (= *Klitambonites*, Pander.)

Protonia, Link.*Productidæ.* **1830.**

Handb. Phys. Erdbeschr. ii. I, p. 449. (= *Productus*, Sow. corrig.) Quenstedt, Petref. Deutschl. ii, 1871, pp. 27, 609; no ex. cited. Not *Protonia*, Rafinesque.

Pseudocrania, M'Coy.*Craniidæ.* **1851.**

Ann. Mag. Nat. Hist. viii, p. 388. Type *Crania antiquissima*, Eichwald, Sil. Schicht. Esthl. 1840, p. 169. Dav. 1856, pl. xiii, f. 22. Cf. Dav. Mon. Sil. Brach. p. 79. M'Coy's 2d sp. *Crania diraricata*, M'Coy, Dav. Mon. Sil. Brach. l. c. pl. viii, f. 7-12. Dav. 1856, pl. xiii, f. 25-26. Syn. ? *Pholidops*, Hall; *Palæocrania*, Quenstedt.

Pugites, De Haan.*Terebratulidæ.* **1833.**

Mus. Lugdun. p. —. Type *Terebratula diphyæ*, Col. Woodw. Man. p. 215, pl. xv, f. 2, 1854. Bronn, Leth. p. 653, 1838, (fide Herrin., Bronn.) (= *Pygope*, Link.)

Pycnodonte, Fischer de Waldheim.*Invertebrata.* **1835.**

Bull. Soc. Imp. Nat. Mosc. viii, pl. i; gen. cont. *Orthis*, sp. et *Gryphæa*, sp. foss.

Pygope, Link.*Terebratulidæ.* **1830.**

Handb. Phys. Erdbeschr. ii, 1, p. 451. Type *Terebratula diphyæ*, Col. von Buch, Ueber Ter. p. 88, t. i, f. 12. King, Perm. Foss. 1850, p. 144. Woodward, Man. p. 215, pl. xv, f. 2. Syn. *Pugites*, De Haan; *Antinomia*, Catullo.

Pyxis, Chemnitz.*Productidæ.* **1784.**

Conchyl. Cab. vii, p. 301, non-binomial; = *Productus pustulosus*, Philippi, Geol. Yorkshire, ii, p. 216, pl. vii, f. 15. Not *Pyxis*, Humphrey, Bell, or Dej.

Rensselaeria, Hall.*Terebratulidae*. 1859.

12th Regent's Rep. p. 39, Oct. 1st sp. *R. suessana*, Hall, l. c. f. 12.
 = *Meganteris* s. Hall, 10th Reg. Rep. 1857, p. 100; Pal. N. York, vol. iii,
 pl. 106 a, f. 1. 2d sp. *Terebratula ovoides*, Eaton, Geol. Textb. p. 45,
 1832; not of Sow. Hall, Pal. N. York, iii, pl. 104-5, f. 1. 12th Reg.
 Rep. l. c. f. 3, 4, 5. Dall, Rev. Ter. 1870, p. 105, took the second sp. as
 the type. (Comp. *Centronella*, Bill.)

Reticularia, McCoy.*Spiriferidae*. 1844.

Carb. Foss. Ireland, p. 142, f. 26, pl. xix, f. 15. 1st sp. *Terebratula* ?
imbricata, Sow. Min. Conch. t. 334, f. 4-6, 1823 (Germ. ed. p. 365).
 (? = *Spirifer*, Sow.)

Retsia, Davidson.*Spiriferidae*. 1856.

Intr. pl. ix; lapsus, = *Retzia*, King.

Retzia, King.*Spiriferidae*. 1859.

Mon. Perm. Fos. p. 137. Type *Terebratula adrieni*, Vern. Hall, 16th
 Reg. Rep. p. 57, f. 4; Dav. 1856, pl. ix, f. 31. Comp. *Acambona*, White;
Eumetria, Hall.

Rhizophyllum, Lindström.*Calceolidae*. 1866.

Öfvers. K. Vet. Akad. Forh. 1865, p. 271, pl. xxxi, f. 1-8. Type *R.*
gotlandicum, Lindstr. l. c. = *Calceola gotl.* F. Roemer. (= *Calceola*, Lam.)

Rhynchonella, Fischer de Waldheim.*Rhynchonellidae*. 1809.

Notice des Fos. Gonv. Moscou, Oct. 26, 1809, p. 35, t. ii, f. 5, 6. Type
R. lorix, Fischer, l. c. Dav. 1853, pl. vii, f. 99. Ib. 1856, pl. x, f. 7. Cf.
Hemithiris, D'Orb.; *Hypothyris*, Phillips; *Rhynchotrema*, Hall. (= *Rhyn-*
chonella, Bl.)

I have been able to consult the original paper.

Rhynchonella, (Fischer) Blainville.*Rhynchonellidae*. 1827.

Blainville, Diet. Sci. Nat. xlv, p. 426, 1827. Fischer de Waldheim,
 Oryct. Gonv. Mosc. 1837, pl. 24. Type *R. lorix*, Fischer, Dav. 1853, pl.
 vii, f. 99. Resembles *R. acuta*, Sow. Lias (Dav. in litt.). Cf. *Hypothyris*,
 Phillips; *Rhynchotrema*, Hall.

Rhynchonellidae, D'Orbigny.*Arthropomata*. 1849.

Cours Élém. Pal. p. 80. Fam. Brach. cont. *Hemithiris*, *Rhynchonella*,
Strigococephalus, *Porambonites*.

Rhynchonellidae, Gray.*Arthropomata*. 1848.

Ann. Mag. Nat. Hist. ii, p. 438. Fam. Brach. cont. *Rhynchonella*, *Came-*
rrophoria, *Uncites*?, *Trigonosemus*, *Rhyncora* (Dalm.), *Pygope*, *Delthyridæ*,
Pentamerus.

Rhynchonellidae, Davidson.*Arthropomata*. 1852.

Intr. p. 51. Fam. Brach. cont. *Rhynchonella*, *Camarophoria*, *Pentamerus*.
 Ibid. 1856, p. 90.

Rhynchonellina, Gemellaro.*Rhynchonellidae*. 1871.

Giorn. Sci. Nat. ed Econ. Palermo, Studj. Pal. sulla Fauna del Calcari
 a Ter. janitor, iii, p. 29. Type *R. Suessi*, Gem. p. 31, l. c. pl. v, f. 1-7. (Jura.)

(This paper not seen, but particulars kindly furnished by
 Mr. Davidson.)

Rhynchopora, King.*Rhynchonellidæ.* 1856.

Ann. Mag. Nat. Hist. 2d ser. xvii, p. 506, pl. 12, f. 11. Type *Rhynchonella Geinitziana*, Verneuil, King, l. c. Not *Rhynchopora*, Illiger, gen. crustaceorum, nor of Latr. gen. coleopterarum.

Rhynchora, Dalman.*Terebratulidæ.* 1828.

Kongl. Vet. Acad. Handl. f. 1827, pp. 105, 135. 1st sp. *Terebr. costatus*, Dalm. l. c. = *Anomites costatus*, Wahl. 1821, Act. Upsal. viii, p. 62, t. iv, fig. 12-14. Supposed by Dalman to = *T. lyra*, Sow. = *Lyra Meadii*, Cumberland. 2d sp. p. 136, *Anomites spathulathus*, Wahl. l. c. t. iv, f. 10, 11, 1821. Dav. 1856, p. 126, pl. vii, f. 19-21, pl. xiv, f. 54, 55. (Cret). Herrmannsen, Index Gen. Mal. Suppl. takes 2d sp. as type. King, Perm. Fos. p. 81, takes the 1st.

Davidson says that Hagenow added a false beak to some of his specimens of *T. costata*, which seems to be a *Trigonosemus*. Woodward mentions the same thing, and adds that a cast of this false beak is in the British Museum. Dalman quotes *T. lyra*, Sow., in his synonymy of *T. costata*, but places a note of interrogation after the "rostrum . . . producta?" in his diagnosis. The name would seem to be well retained as a subgenus of *Magas*, with the second species as the type.

Rhynchoridæ, King.*Arthropomata.* 1850.

Perm. Fos. p. 81 (p. 245, olim). Fam. Brach. cont. *Ismenia*, *Deltthyridæa*, *Rhynchora*.

Rhynchospira, Hall.*Spiriferidæ.* 1859.

12th Regent's Rep. Oct. pp. 28, 29, f. 1-6. Type *R. formosa*, Hall, l. c. Pal. N. York, iii, p. 484, pl. xcv, a, f. 7-11, same type, 1859. (Comp. *Retzia*, King.)

Rhynchotrema, Hall.*Rhynchonellidæ.* 1860.

13th Regent's Rep. App. F. p. 63. Type *Rhynchonella increbescens*, Hall, l. c. p. 66, f. 8-13. (L. Sil.) = *Atrypa incr.* Hall, Pal. N. York, 1847, vol. i, pp. 146, 229, pl. 33, f. 13 a-g, pl. 79, f. 6, = *A. capax*, Conrad, Journ. Phil. Acad. Nat. Sci. viii, p. 264, 1842. (Comp. *Rhynchonella*, F.)

Rhynchura, Agassiz.*Terebratulidæ.* 1847.

Nom. Zool. Index, p. 942, = *Rhynchora*, Dalm. corrig.

Rhyncora, Gray.*Terebratulidæ.* 1848.

Ann. Mag. Nat. Hist. ii, p. 438; lapsus, = *Rhynchora*, Dalm.

Rhynchospira, Hall.*Spiriferidæ.* 1859.

Pal. N. York, iii, 1859, p. 213, subg. *Trematospira*. (L. Held.) 1st sp. *Trematospira globosa*, Hall, l. c. p. 215, pl. 36, f. 1 a-p. Lapsus, = *Rhynchospira*.

Rhynгонella, Bronn.*Rhynchonellidæ.* 1849.

Nom. Pal. iii, p. 1087, lapsus, = *Rhynchonella*, Fischer.

- Rhynobolus**, Hall. *Trimerellidae*. 1871.
23d Regent's Rep. p. 247, pl. 13, f. 10, 1872. Extras Mar. 1871, fide Hall. Type *Obolus galtensis*, Bill. Hall, l. c. (= *Trimerella*, Bill.)
- Sacculus**, Llhwyd. *Brachiopoda*. 1699.
Lith. Brit. Ichn. p. 42, no. 871; non-binomial. Gen. incert.
- Sandaliolite**, Rozier. *Calceolidae*. 1771.
Journ. de Phys. iii, p. 150; non-binomial. (= *Calceola*, Lam.)
- Sandalolithus**, Hupsch. *Calceolidae*. 1768.
Nene Entdeck. p. 56; non-binomial. (= *Calceola*, Lam.)
- Sandalite**, Rozier. *Calceolidae*. 1771.
Journ. de Phys. iii, p. 150; non-binomial. (= *Calceola*, Lam.)
- Sandalites**, Hupsch. *Calceolidae*. 1768.
Neue Entdeck. p. 56; non-binomial. (= *Calceola*, Lam.)
- Sandalium**, Oken. *Calceolidae*. 1815.
Lehrb. der Naturges. iii, p. vii. (= *Sandalites*, Hupsch. corrig.)
- Sarcicobrachia**, Gray. *Brachiopoda*. 1848.
Ann. Mag. Nat. Hist. ii, p. 436. Ord. Brach. cont. *Productidae*, *Craniadae*, *Discinidae*, *Lingulidae*.
- Sarcicobrachia**, King. *Brachiopoda*. 1850.
Perm. Foss. p. 81. Ord. Brach. cont. *Lingulidae*, *Obolidae*, *Craniadae*, *Discinidae*, *Calceolidae*, *Davidsonidae*, *Productidae*, *Strophomenidae*.
- Sarcicobranchia**, Paetel. *Brachiopoda*. 1875.
Fam. u. Gatt. Moll. p. 185; lapsus, = *Sarcicobrachia*, Gray.
- Schizocrania**, Hall and Whitfield. *Discinidae*. 1875.
Pal. Ohio, ii, p. 71, pl. i, f. 12-15. (Cincin. Gr.) Type *Orbicula filosa*, Hall, Pal. N. York i, p. 99, pl. xxx, f. 9. = *Trematis* f. Hall, 23d Reg. Rep. expl. pl. xiii, f. 21-22.
- Schizophoria**, King. *Strophomenidae*. 1850.
Perm. Fos. p. 106. Type *S. resupinatus*, King, = *Conch. an. resupinatus*, Martin, Petref. Derb. 1809, p. 12, t. 49, f. 13-14, = *Orthis res.*, Phillips, Pal. fos. Cornwall and Devon. p. 67, t. 27, f. 15, and Murch. Vern. Keys. Geol. Rus. Ural, ii, 183, t. 12, f. 5, 6. (= *Orthis*, Dalm.)
- Schizotreta**, Kutorga. *Discinidae*. 1848.
Verh. K. Min. Ges. St. Petersburg f. 1847, pp. 260, 272, t. vii, f. a-c. Type *S. elliptica*, Kut. l. c. (Sil.) Dav. 1856, pl. xiv, f. 1-3. (= *Orbiculoidea*, D'Orb.)
- Sclerobrachia**, Gray. *Brachiopoda*. 1848.
Ann. Mag. Nat. Hist. ii, p. 436. Ord. Brach. cont. *Spiriferidae*, *Rhynchonellidae*.
- Sclerobrachia**, King. *Brachiopoda*. 1850.
Perm. Foss. p. 81. Ord. Brach. cont. *Hypothyridae*, *Spiriferidae*.

- Schmidtia**, Volborth. *Obolidae*. 1869.
Verh. K. Min. Ges. St. Petersburg, iv, 1868, p. 208, t. 17, f. 1-6. Sole ex. *S. celata*, Volb. l. c. (Sil.) p. 209. Quenst. Petref. Deutschl. 1871, p. 671. ? Syn. *Dicellomus*, Hall. Not *Schmidtia* of Bals.-Criv. gen. *Porifera*, 1863.
- Semibrachidés**, D'Orbigny. *Brachiopoda*. 1849.
Cours Élém. Pal. p. 80. Sect. *Brachidae* cont. *Spiriferidae*, *Magasidae*, *Terebratulida*, *Orbiculidae*, *Cranidae*.
- Semiluna**, King. *Arthropomata*. 1846.
Ann. Mag. Nat. Hist. xviii, pp. 33, 36; lapsus, = *Seminula*, McCoy.
- Seminula**, McCoy. *Arthropomata*. 1844.
Carb. Foss. Ireland, p. 158; p. 150, f. 31. 1st sp. *Terebratula pentaëdra*, Phillips, Geol. Yorkshire, p. 221, t. 12, f. 3, 1836, = *Athyris ambigua*, Sow. fide Davidson; 2d sp. *T. seminula*, Phil. l. c. p. 222, t. 12, f. 21-23; 3d sp. *T. rhomboidea*, Phil. l. c. p. 222, t. 12, f. 18-20. (Nos. 2 and 3 are probably *Rhynchonella*.) McCoy's first or typical species being a true *Athyris*, the name *Seminula* should take precedence of *Spirigera*, D'Orb, if *Athyris* be dropped.
- Seminula**, McCoy. *Terebratulidae*. 1855.
Pal. Foss. Cambridge Mus. p. 408. (Not seen by me. Stated to have been proposed this time for the group of *Terebratula* already characterized by King as *Epithyris* and afterward as *Diclasma*.) Not *Seminula*, McCoy, 1844. (= *Epithyris*, King, not Phil.)
- Sessiles**, Latreille. *Brachiopoda*. 1825.
Fam. Nat. Règne An. p. —. Ord. cont. fam. *Fixivalves*, Latr.
- Sessilia**, Berth. *Brachiopoda*. 1827.
Germ. ed. Latreille, Fam. Nat. p. 196. Ord. cont. fam. *Fixivalvia*. (= *Sessiles*, Latr.)
- Sessilia**, Fleming. *Lyopomata*. 1828.
Brit. An. pp. 225, 367. Fam. Brach. cont. *Discina*, *Criopus*.
- Shizotreta**, Davidson. *Discinidae*. 1856.
Int. p. 232 in syn. lapsus; = *Schizotreta*, Kutorga.
- Siphonotrema**, Dana. *Lyopomata*. 1849.
Geol. U. S. Expl. Exp. p. 615; lapsus, = *Siphonotreta*, Vern.
- Siphonotreta**, Verneuil. *Siphonotretidae*. 1845.
Murch. Vern. u. Keyserl. Geol. Rus. Ural, ii, p. 236. Type *Crania unguiculata*, Eichwald, Dav. 1856, p. 239, pl. xiv, f. 9-18. Kutorga, Verh. K. Min. Ges. St. Petersburg, f. 1847, p. 261. Same type (Sil.) p. 264, t. vi, f. 4-6, 1848.
- Siphonotretææ**, Kutorga. *Lyopomata*. 1848.
Verh. K. Min. Ges. St. Petersburg f. 1847, p. 250. Fam. Brach. cont. *Siphonotreta*, *Schizotreta*, *Aerotreta*, *Aulonotreta*, *Mesotreta*.
- Siphonotretææ**, Morris. *Lyopomata*. 1849.
Ann. Mag. Nat. Hist. iv, p. 315. = *Siphonotretææ*, Kut.

Skenidium, Hall.*Spiriferida*?. 1860.

13th Regent's Rep. p. 70, Dec. f. 2, 4, 5. Type *Orthis insignis*, Hall, l. c.
(Comp. *Rhynchora spathulata*, Dalm.) Relations doubtful, perhaps Strophomenoid.

Spirifer, Rafinesque.*Spiriferida*. 1831.

Mon. Biv. Shells Ohio, p. 7. No ex. cited; lapsus, = *Spirifer*, Sow.

Spirifer, Sowerby.*Spiriferida*. 1815.

Min. Conch. ii, p. 42, t. 120. Sole ex. *S. cuspidatus*, Sow. l. c. (Carb.)
= *Anomites cuspidatus*, Martin, Trans. Lin. Soc. iv, p. 45, t. 3, and t. 4, f.
5. Dav. Mon. Carb. Brach. pp. 44, 224.

This is the first printed reference to the genus, and it has been urged with much force by eminent authorities that the sole species mentioned here must necessarily be taken as the type of the genus. But Sowerby had previously presented a paper (in 1814), which was then read before the Linnean Society, and the substance of which became known not only in England but on the continent (cf. Dav. 1853, p. 81). This was published in the Linnean Transactions, xii, pp. 514-515, 1821, and in it the discovery of the spires from which the genus takes its name, in the *Anomites striatus*, Martin (Petref. Derb. t. 23, 1809), Sow. l. c. p. 515, t. 28, f. 1-2, was announced, while at the same time Sowerby notes that their presence in *S. cuspidatus* was only surmised at that time. On these grounds, the majority of modern authors have justifiably regarded *S. striatus* as the type (see Dav. 1856, p. 159, pl. viii, f. 22-23). This decision is of more importance, since *S. cuspidatus* belongs to a section of the genus differing in some details from that typified by *S. striatus*, and which has been recognized under the name *Syringothyris* applied by Winchell. If the work of restriction were to be done over again from the very beginning, it is probable that most authors would consider the rules of nomenclature better served by taking *cuspidatus* as the type, but the reverse process has been the rule among authors so long that it would be a serious detriment to science to attempt such a change at present.

Syn. *Spirifera*, Phillips, J. de C. Sowerby; *Trigonotreta*, König, &c.
Comp. *Spirifer*, King, Meek, &c.

Spirifer, Meek and Hayden.*Spiriferida*. 1864.

Pal. Upper Missouri (Carb.), p. 19. Mr. Meek, considering *S. cuspidatus*, Sow., the first species published under the name of *Spirifer* as the true type, defines the genus upon that basis. Cf. *Spirifer*, Sow.; *Cyrtia*, Dalm.; *Trigonotreta*, König; *Syringothyris*, Winchell.

- Spirifera**, J. de C. Sowerby. *Spiriferidae*. 1835.
Index Sow. Min. Conch. 1835; Phillips, Geol. Yorksh. ii, and Dav. 1856, p. 157. (= *Spirifer*, Sow.)
- Spirifera**, McCoy. *Spiriferidae*. 1844.
Carb. Foss. Ireland, p. 123, f. 17. 1st sp. *Terebratula aperturata*, Schloth. Petref. i, 258, ii, p. 67, t. xvii, f. 1.
- Spiriferidae**, King. *Arthropomata*. 1846.
Ann. Mag. Nat. Hist. xviii, p. 28. Fam. Brach. cont. *Spirifer*, *Atrypa*, *Martinia*, *Strigoccephalus*.
- Spiriferidae**, Gray. *Arthropomata*. 1848.
Ann. Mag. Nat. Hist. ii, p. 437. Fam. Brach. cont. *Spirifer*, *Strigoccephalus*.
- Spiriferidae**, D'Orbigny. *Arthropomata*. 1849.
Cours Élém. Pal. p. 80. Fam. Brach. cont. *Cyrtia*, *Spirifer*, *Spiriferina*, *Spirigerina*, *Spirigera*.
- Spiriferidae**, King. *Arthropomata*. 1850.
Perm. Foss. p. 81. Fam. Brach. cont. *Atrypa*, *Athyris*, *Cleiothyris*, *Retzia*, *Delthyris*, *Trigonotreta*, *Spirifer*, *Martinia*.
- Spiriferidae**, Davidson. *Arthropomata*. 1853.
Intr. p. 51. Fam. Brach. cont. *Spirifer*, *Athyris*, *Spirigera*, *Uncites*, *Atrypa*, and subg. *Spiriferina*, *Cyrtia*, *Retzia*.
- Spiriferidae**, Davidson. *Arthropomata*. 1856.
Intr. p. 90. Fam. Brach. cont. *Spirifera*, with subg. *Spiriferina*, *Cyrtia*, *Suessia*; *Athyris*, with subg. *Merista*, *Retzia*, *Uncites*; *Atrypa*; ? *Koninekina*.
- Spiriferina**, D'Orbigny. *Spiriferidae*. 1847.
Comptes Rendus, xxv, p. 268. No ex. cited. Id. D'Orb. Ann. Sci. Nat. xiii, 1850, p. 334. Type *Spirifer Walcottii*, Sow. = *S. rostrata*, Schloth, sp. fide Dav. 1856, p. 161, pl. ix, f. 1-5, 11, 14.
- Spiriferus**, Blainville. *Spiriferidae*. 1827.
Diet. Sci. Nat. t. 50, p. 291. = *Spirifer*, Sow.
- Spirigera**, D'Orbigny. *Spiriferidae*. 1847.
Comptes Rendus, xxv, p. 268. No ex. cited. Pal. Franç. Ter. Cret. iv, p. 357; Ann. Sci. Nat. xiii, 1850, p. 337, sole ex. and type *S. concentrica*, von Buch; Chenu, Man. ii, p. 216, f. 1108-10; Dav. 1853, p. 87, pl. vi, f. 65-67; Billings, 1867, Ann. Mag. Nat. Hist. xx, p. 233. (= *Athyris*, McCoy.)
- Proposed to replace *Athyris* with the same type, on account of discrepancies between the diagnosis and name of *Athyris* and the real characters; but, if that be rejected, *Seminula* would antedate this name.
- Spirigerina**, D'Orbigny. *Atrypidae*. 1847.
Comptes Rendus, xxv, p. 268. No ex. cited. Ann. Sci. Nat. xiii, 1850, p. 334. Type *Anomites reticularis*, Linné, Dav. 1856, p. 175, pl. ix, f. 39-46. (= *Atrypa*, Dalman.)

Spirobranchiophora, Gray.*Invertebrata*. 1821.

London Med. Repository, p. 233. Tribe Moll. aceph. = *Brachiopoda*, Cuv.

Spondylobelus, McCoy.*? Obolidae*. 1852.

Ann. Mag. Nat. Hist. viii, p. 407. Types *S. craniolaris*, McCoy, Dav. 1856, pl. xiii, f. 37 (Sil.), and *Crania Sedgwicki*, Lewis. The latter appears not to be a brachiopod. Cf. Dav. Mon. Sil. Braeh. p. 83, pl. viii, f. 25.

Spondylobus, Davidson.*? Obolidae*. 1853.

Intr. p. 122, in syn. Dall, Am. Journ. Conch. vi, pp. 100, 163-5; lapsus, = *Spondylobelus*, McCoy.

Stenocisma, Conrad.*Pentameridae*. 1839.

Ann. Rep. Geol. N. York, p. 59. Sole ex. *Terebratula schlotheimi*, von Buch; Chenu, Man. ii, p. 220, f. 1132 (Sil.), ser. *Stenoschisma*. Syn. *Camerophoria*, King. Not *Stenocisma*, Hall, 1847, nor 1859.

Conrad's diagnosis is very short but explicit, and agrees perfectly with the characters of the species he cites as type, but which he does not figure. His typical specimens are not preserved. Professor Hall, on the ground that Conrad had abandoned his genus, proposed, in 1847, to apply the *Stenocisma* to a group of *Atrypidae* typified by *A. modesta*, Say. In July, 1862, however, Professor Hall, having investigated the interior of this species, proposed for it the name *Zygospira*. This was in conformity with the well-established rule that a genus once described passes out of the control of its describer, and, except for identity of characters with some other, cannot be wilfully remanded to oblivion.

In 1859, Professor Hall (Pal. N. Y. iii, 236, t. xxxv, f. 6 a-y) described a brachiopod from the Lower Helderberg under the name of *Rhynchonella formosa*. In 1867-68 (Pal. N. Y. iv, p. 334, and 20th Reg. Rep. p. 270), Professor Hall refers to an unpublished lithograph, with MS. notes upon it, by Mr. Conrad, among which a figure (referred by Professor Hall to his *Rhynchonella formosa*) is stated to be named *Ter. schlotheimi* in Mr. Conrad's handwriting. For that reason, Professor Hall, considering *R. formosa* to represent a particular group of *Rhynchonellidae*, proposes to revive Conrad's name of *Stenocisma* for the group in question. In spite of some reasons which seem to recommend this course, it still remains very doubtful whether it is desirable to be adopted.

Mr. Conrad may have confounded the *R. formosa* with *T.*

schlotheimi at the time of preparing this plate, as the two shells are not dissimilar externally. Or he may have intended to represent *T. schlotheimi*, and failed to do so sufficiently to allow his figure to be distinguished from *R. formosa*. Any one familiar with Mr. Conrad's plates will not doubt the possibility of this. But there does not appear to be any certain method of deciding that there was any necessary connection between this figure and the "common Silurian bivalve" which Mr. Conrad had in his mind when he proposed his genus, and with which his diagnosis agrees. The fact that the same species was afterward made the type of the genus *Camerophoria* by Professor King has no bearing on the question.

To the writer there seems no escape from the necessity of taking Mr. Conrad's citation as it stands, and thus conforming to the rules of nomenclature, although in so doing we shall be obliged to reduce to the rank of a synonyme a name which has been widely recognized and generally adopted.

Stenocisma, Hall.

Atrypidae. 1847.

Pal. N. York, i, p. 142, pl. 33, f. 15. Type *Atrypa modesta*, Say; Hall l. c. (Trenton Gr.). Ser. *Stenoschisma*; not *Stenocisma*, Conrad, 1839, nor Hall, 1867. (= *Zygospira*, Hall.)

Stenocisma, Hall.

Rhynchonellidae. 1867.

Pal. N. York, iv, p. 334. Type *Rhynchonella formosa*, Hall, Pal. N. Y. iii, p. 236, pl. 35, f. 6 a-y (L. Held.). Ser. *Stenoschisma*, not *Stenocisma*, Hall, 1847. (Comp. *Rhynchonella*, Fisch.)

Stola, Klein.

Invertebrata. 1753.

Ostracol. p. 173, non-binomial, pl. xii, f. 82-86. Gen. cont. *Chama* sp. *Brachiopoda* sp. Name cited *Spoudyli Listeriana*, Klein, l. c. incl. several things.

Stophalosia, Bronn.

Productidae. 1848.

Leonh. u. Bronn, Jahrb. f. Min. p. 248; lapsus, = *Strophalosia*, King.

Strepheodonta, Marschall.

Strophomenidae. 1873.

Nom. Zoöl. p. 140; lapsus, = *Strophodonta*, Hall.

Streptorhynchus, King.

Strophomenidae. 1850.

Mon. Perm. Foss. p. 107 (Carb. and Perm.). Type *Terebratulites pelargonatus*, Schloth. Denkschr. Acad. München. vi, t. 8, f. 21-23. Dav. 1856, pl. xi, f. 27. Dav. Mon. Perm. Brach. ii, f. 33, 40-42. (See *Hemipronites*, P.)

Stricklandia, Billings.

Pentameridæ. 1859.

Canadian Naturalist, iv, April, p. 132, f. 8-10. (Sil.) 1st sp. *Atrypa lous* (Sow. ?), Bill. l. c. Murch. Sil. Syst. pl. 8, f. 9, 10.

Billings, Can. Nat. 1863, pp. 78-85, refers species to the genus which are probably not congeneric. Cf. Hall, Pal. N. York, vol. iv, p. 373, 1867; *S. canadensis* is the first of a series of characteristic forms referred to the revised genus by Hall. Not *Stricklandia*, gen. plantarum. Cf. *Stricklandinia*.

Stricklandinia, Billings.

Pentameridæ. 1863.

Can. Nat. viii, 1863, p. 370. (Sil.) Proposed for *Stricklandia*, Bill., which had previously been used in botany, though this, under the prevailing practice of naturalists, was quite unnecessary. (= *Stricklandia*, Bill.)

Strigocephalidæ, King.

Arthropomata. 1850.

Perm. Foss. p. 81. Fam. Brach. cont. *Strigocephalus*.

Strigocephalus, DeFrance.

? Terebratulidæ. 1827.

Diet. Sci. Nat. vol. li, p. 102, pl. 75, f. 1, 1 a. Type *S. Burtini*, DeFrance, l. c. Woodward, Man. p. 222, f. 130, 131, pl. xv, f. 13. Ser. *Stringocephalus*, q. v.

Stringocephalidæ, Davidson.

Arthropomata. 1853.

Intr. p. 51, (?) fam. Brach. cont. *Stringocephalus*.

Stringocephalinae, Dall.

Terebratulidæ. 1870.

Am. Journ. Conch. vi, p. 99. Subfam. Brach. cont. *Stringocephalus*.

Stringocephalus, Sandberger.

Terebratulidæ. 1842.

Leonh. u. Bronn, Jahrb. für Min. 1842. Dav. 1853, p. 73, pl. vii, f. 95-98. Type *S. Burtini*, DeFr., Dav. l. c. = *Stringocephalus*, DeFr. bene corrig.

Strophalosia, King.

Productidæ. 1844.

Ann. Mag. Nat. Hist. xiv, p. 313. No ex. cited. Ibid. l. c. 1846, xvii, p. 92. Type *Orthis excavatus*, Geinitz, Neues Jahrb. 1842, p. 578, pl. x, f. 12, 13 (Dev.). King, Perm. foss. p. 93, pl. xii, f. 13-17, 1850. Syn. *Orthothrix*, Geinitz; *Leptaenolosia* (olim), King.

Stropheodonta, Hall.

Strophomenidæ. 1852.

Pal. N. Y. ii, p. 63. Type *S. demissa*, Conrad; figures *S. prisca*, Hall, pl. xxi, f. 9 a-b, 1852. Dav. 1856, Intr. p. 203, note. Mon. Sil. Brach. p. 386. Brit. Foss. Brach. appendix, p. 28, 1874. = *Stropheodonta*, Hall, emend.

Strophesia, Rafinesque.

Brachiopoda. 1820.

Ann. Gen. Sci. Phys. Bruxelles, v, p. 232; name cited without diagn. or ex. Mon. Biv. Shells Ohio, p. 8; no ex. cited. Genus incert.

Strophodonta, Hall.

Strophomenidæ. 1850.

Proc. Am. Assoc. 1850, p. 348; 10th Reg. Rep. p. 138, f. 12. *S. demissa*, Cour. sp. (Ham. Gr.) Rep. Pal. Iowa, t. ii, f. 5 a-c; Journ. Acad. Nat. Sci. Phil. viii, p. 258, t. 14, f. 14, 1842. (Ser. *Stropheodonta*.)

Stropholosia, Gray. *Productida.* 1848.

Ann. Mag. Nat. Hist. ii, p. 438; lapsus, = *Strophalosia*, King.

Strophomena, Blainville. *Strophomenida.* 1825.

Man. Mal. i, p. 513, ii, pl. liii, f. 2. Sole ex. *S. rugosa*, Bl., which (fide Meek) is *S. planumbona*, Pal. Ohio, i, p. 73, 1873, = *Leptaena planumbona*, Hall, 1847, Pal. N. York, vol. i, p. 112, pl. xxxi B, f. 4 a-e. Adt. King, Perm. Foss. p. 103, 1850. See *Hemipronites*, Pander.

Strophomena, King. *Strophomenida.* 1846.

Ann. Mag. Nat. Hist. xviii, p. 36. Type *S. rugosa*, (Raf.) Bl.

King here considers Blainville's type congeneric with *Leptaena alternata*, which has socket-valve concave, while *planumbona* had been said to have it convex. But in Perm. Fos. p. 103, Professor King concludes that it is concave in *planumbona* also, which appears to be the fact.

Strophomena, Davidson. *Strophomenida.* 1853.

Intr. p. 105, pl. viii, f. 157-159. Type *S. planumbona*, Hall. Dav. l. c. includes *Orthis? pecten*, Dalm. Ibid. 1856, p. 200. Ditto, Sharpe, Quart. Journ. Geol. Soc. London, iv, p. 178. (= *Strophomena*, Blainv.)

Strophomena, Meek. *Strophomenida.* 1873.

Pal. Ohio, i, p. 73, pl. v, f. 6 a-c. Type *S. rhomboidalis*, Wilck. [= *Leptaena*, Dalman, King, not of Davidson.] (= *Plectambonites*, Paud.)

Strophomenes, Rafinesque. (*Incertæ sedis.*) 1820.

Annals Gen. Sci. Phys. Bruxelles, v, p. 232, 1820. Name only; no diagn. or ex. cited. "Annals of Nature, Oct. 1, 1820", fide Rafinesque, but not to be found there. Descr. Rem. Objects Cab. Raf., Nov. 1831, p. 4. 1st sp. *S. levigata*, Raf. foss. Ohio Limestone; descr. insufficient. De-france, Tabl. p. 6, 1824; name only. No ex. cited. (*Genus indeterminate.*)

Professor Hall says he saw, in Rafinesque's cabinet, after it had passed through several hands, a specimen of *Strophomena rhomboidalis*, Wilckens, labelled by Raf. as *S. rugosa*. But this is insufficient to determine the character of his original type, even if the label had certainly not been misplaced, as Rafinesque has even united a coral and a *Trigonia* in one genus as brachiopods! The genus must stand as of Blainville, and by his figured type, if it is to be retained at all. See *Hemipronites*, Pander.

Strophomenes, Steining. *Strophomenida.* 1831.

Verst. der Eifel, p. 36. Not seen. (= *Orthis*, Dalman.)

Strophomenida, King. *Arthropomata.* 1846.

Ann. Mag. Nat. Hist. xviii, p. 28. Fam. Brach. cont. *Strophomena*, *Orthis*, *Leptaena*, *Chonetes*.

- Strophomenidæ**, King. *Arthropomata*. 1850.
Perm. Foss. p. 81. Fam. Brach. cont. *Strophomena*, *Leptaena*, *Chonetes*, *Orthis*, *Schizophoria*, *Streptorhynchus*, *Orthisina*, *Diclosia*, *Platystrophia*.
- Strophomenidæ**, Davidson. *Arthropomata*. 1853.
Intr. p. 51. Fam. Brach. cont. *Orthis*, *Orthisina*, *Strophomena*, *Leptaena*.
- Strophomenidæ**, Davidson. *Arthropomata*. 1856.
Intr. p. 90. Fam. Brach. cont. *Porambonites*; *Orthis*, with subg. *Orthisina*; *Strophomena*, with subg. *Leptaena*; ? *Davidsonia*.
- Strophomena**, Rang. *Strophomenidæ*. 1829.
Man. Moll. p. 261; Gray, Ann. Mag. Nat. Hist. ii, 1848, p. 433, lapsus;
= *Strophomena*, Raf.
- Strygocephale**, Blainville. *Terebratulidæ*. 1825.
Man. Malac. p. 511, pl. liii, f. 1. *Ter. Burtini*, DeFr. l. c. (= *Stringocephalus*, Sandb.)
- Strygocephalus**, Bronn. *Terebratulidæ*. 1848.
Index Pal. iii, p. 1208; lapsus, = *Strygocephalus*, DeFr.
- Styriasis**, Rafinesque. *Brachiopoda*. 1821.
Mon. Biv. Shells Ohio, p. 8. No ex. cited. *Genus incert.*
- Suessia**, Deslongchamps. *Spiriferidæ*. 1854.
Annales Inst. des Provinces, 1854. Dav. Mon. Brit. Fos. Brach. i, p. 28.
Appendix, 1854. Dav. 1856, p. 165, pl. ix, f. 6, 13-18. Type *S. imbricata*,
Desl. l. c. (subg. *Spirifer*).
- Syntriclasma**, Meek. *Pentameridæ*. 1865.
Proc. Acad. Nat. Sci. Phil. Dec. 1865, p. 277. Geol. Rep. Illinois, Pal.
vol. ii, p. 321, f. 36-37. Type *Spirifer hemiplicatus*, Hall, 1862. Staus-
bury's Great Salt Lake Rep. p. 409, pl. iv, f. 3 a-b.
- Syntriclasma**, Carpenter. *Pentameridæ*. 1867.
Ann. Mag. Nat. Hist. xx, p. 73, passim; Quenstedt, Petref. Deutschl. ii,
p. 724, 1871; lapsus, = *Syntriclasma*, Meek.
- Syphnothyridæ**, Quenstedt. *Arthropomata*. 1871.
Petref. Deutschl. ii, p. 27. Subsect. *Productidæ* cont. *Productus*, *Pro-*
tonia, *Chonetes*, *Koninckina*, *Strophalsia*, *Gryphites*, *Bufocephalus*, *Pyxis*.
- Syringothyris**, Winchell. *Spiriferidæ*. 1863.
Proc. Acad. Nat. Sci. Phil. Jan. 1863, p. 6. Type *S. typa*, Winchell,
l. c. (= *Spirifer cuspidatus*?) Cf. King, Ann. Mag. Nat. Hist. 1863, ii,
July, p. 1, pl. ii, iii. (Sil.)
- Telestrophis**, Agassiz. *Invertebrata*. 1847.
Nom. Zool. Index, p. 1047. = *Telistrophis*, Raf. corrig.
- Telistrophis**, Rafinesque. (*Incertæ sedis.*) 1832.
Atlantic Journal iv, p. 142, f. 7. Sole ex. *T. torsala*, Raf. l. c. ? =
Spirifer sp., distorted. *Genus incert.*
- Tendinosa**, Reeve. *Brachiopoda*. 1844.
Conch. Syst. i, p. 174. Tribe Brach. cont. *Lingula*, *Terebratula*. (= *Pedunculata*, Berth.)

Terebraria, Rafinesque.*Brachiopoda*. 1831.

Mon. Biv. Shells Ohio, p. 7. Fam. Brach. cont. sect. *Macrilia*, *Isilia*, *Platilia*.

Terebratella, D'Orbigny.*Terebratulidae*. 1847.

Comptes Rendus, xxv, p. 269. No ex. cited. Pal. Franç. Ter. Cret. iv, p. 110, 1847. Ann. Sci. Nat. viii, p. 247. Type *Ter. chilensis*, Brod. = *Terebratula dorsata*, Lamarek. An. s. Vert. v, vii, p. 331, 1819. Dav. 1853, p. 65. Sowerby, Thes. Conch. viii, p. 346, t. 63, f. 15, 16, 17. (Recent.) Syn. *Delthyris*, Mke.; *Ismenia*, King.

Terebratellidae, King.*Arthropomata*. 1850.

Perm. Foss. p. 245. Fam. Brach. cont. *Terebratella*, *Megerlia*, *Ismenia*.

Terebratula, Llhwyd.*Terebratulidae*. 1699.

Lith. Brit. Ich. p. 40, no. 827-865. Non-binomial. Adt. Lang. 1708, Klein, 1753, &c. Cf. *Terebratula*, Müller.

Terebratula, Klein.*Arthropomata*. 1753.

Ostracol. p. 171, pl. xi, f. 74. Non-binomial. 1st sp. *T. simplex*, Klein, l. c. = *Terebratula*, sp.

Terebratula, O. F. Müller.*Terebratulidae*. 1776.

Prodr. Zool. Danica, pp. xxxi and 249. 1st sp. *T. cranium*, Müller, Others, = *Terebratulina*, sp. and indeterminate. Müller cannot be said to have settled the type; his indeterminate sp. may have been *T. vitrea*. Cuvier, 1795, Tabl. Élém. p. 434; 1st sp. *Terebratula vitrea*; Gray, B. M. Cat. p. 17, f. 3 a-b. In synonymy of this, he (Cuvier) places *Anomia terebratula*, Linné. Lam. Prodrone, 1799, p. 89, sole ex. *Anomia terebratula*, Linné, = (fide Hanley), *Terebratula perovialis*, Sow. Dav. Mon. Ool. Brach. p. 51, pl. x, f. 1-6. (Oolitic.) Lam. Syst. 1801, same type.

T. vitrea, Lam., and *T. perovialis*, Sow., are generally accepted as the types of the genus as now restricted. But if it is insisted that Müller's first species must be taken as type, *Terebratula* would = *Waldheimia* (*Eudesia*), as generally understood, and the present *Terebratulæ* would have to take the name of *Gryphus*, Megerle.

Terebratulacea, Menke.*Brachiopoda*. 1830.

Synops. Mus. Menkeanum, ed. ii, p. 95. Fam. Brach. cont. *Terebratula*, *Atrypa*, *Uncites*, *Gypidia*, *Magas*, *Delthyris*, *Cyrtia*, *Orthis*, *Monotis*, *Leptacna*, *Megorima*, *Ap'leurotis*.

Terebratulaceæ, Menke.*Terebratulidae*. 1828.

Syn. Mus. Mke. p. 56, olim. Fam. Brach. cont. *Terebratula*, *Magas*.

Terebratuladæ, Leach, MS.*Arthropomata*. 1847.

Gray, Ann. Mag. Nat. Hist. xx, p. 273. Fam. Brach. cont. *Terebratula*.

Terebratulæ, Deshayes.*Arthropomata*. 1830.

Enc. Méth. iii, p. 553, tabl. Fam. Brach. cont. *Terebratula*, senso magno.

- Terebratulamina**, Gray. *Arthropomata*. 1853.
Brit. Mus. Cat. Brach. p. 15. Tribe Brach. cont. *Terebratula*, *Terebratulina*, *Waldheimia*.
- Terebratularius**, Dumeril. *Terebratulidæ*. 1806.
Zool. Analyt. p. 163. = *Terebratula*, Auct.
- Terebratulidæ**, Gray. *Arthropomata*. 1840.
Synopsis. Cont. Brit. Mus. i, p. 155. Fam. Brach. cont. *Terebratula*, *Spirifer*.
- Terebratulidæ**, McCoy. *Arthropomata*. 1844.
Carb. Foss. Ireland, p. 150. Fam. Brach. cont. *Delthyridæ*, *Terebratula*, *Cyclothyris*, *Atrypa*, *Semula*.
- Terebratulidæ**, King. *Arthropomata*. 1846.
Ann. Mag. Nat. Hist. xviii, p. 28. Fam. Brach. cont. *Terebratula*, *Hypothyris*, *Pentamerus*, *Camerothoria*, *Uncites*.
- Terebratulidæ**, D'Orbigny. *Arthropomata*. 1847.
Comptes Rendus, xxv, p. 269. Fam. Brach. cont. *Terebratella*, *Terebratula*, *Terebrirostra*, *Fissirostra*.
- Terebratulidæ**, Gray. *Arthropomata*. 1848.
Ann. Mag. Nat. Hist. ii, p. 436. Fam. Brach. cont. "*Magas*, *Terebratula*, *Terebratulina*, *Terebrirostris*, *Fissirostris*, &c."
- Terebratulidæ**, King. *Arthropomata*. 1850.
Perm. Foss. p. 81 (p. 244 olim). Fam. Brach. cont. *Epithyris*, *Terebratella*, *Terebratula*, *Pygope*, *Eudisia*, *Megerlia*, *Waldheimia*.
- Terebratulidæ**, King. *Arthropomata*. 1850.
Perm. Foss. p. 245. Fam. Brach. cont. *Terebratula*, *Terebratulina*, *Delthyridæ*, *Waldheimia*, *Epithyris*, *Pygope*.
- Terebratulidæ**, Davidson. *Arthropomata*. 1853.
Intr. p. 51. Fam. Brach. cont. *Terebratula*, subg. *Terebratulina*, *Waldheimia*; *Terebratella*, subg. *Trigonosemus*, *Terebrirostra*, *Megerlia*; *Kraussia*, *Magas*, *Bouchardia*, *Morrisia*, *Argiope*.
- Terebratulidæ**, Davidson. *Arthropomata*. 1856.
Intr. p. 90. Fam. Brach. cont. *Terebratula* with subg. *Terebratulina*, *Waldheimia*; *Terebratella*, with subg. ? *Trigonosemus*, ? *Terebrirostra*, *Megerlia*, *Kraussia*, *Magas*, *Bouchardia*, *Morrisia*; subfam. *Thecideidæ*, with *Argiope*, and subg. *Zellania*; *Stringocephalus*; *Thecidium*.
- Terebratulidæ**, Dall. *Arthropomata*. 1870.
Am. Journ. Conch. vi, p. 99. Fam. Brach. cont. *Terebratulina*, *Stringocephalina*, *Magasina*, *Kraussinina*, *Megathyrina*, ? *Platidiina*, ? *Theciidina*.
- Terebratulidæ**, Quenstedt. *Arthropomata*. 1871.
Petref. Deutschl. ii, p. 27. Sect. i of *Mesopygia*, cont. *Hypothyridæ*, *Epithyridæ*.

- Terebratulidea**, Sowerby. *Brachiopoda*. 1822.
Trans. Lin. Soc. Lond. xiii, p. 469. = *Brachiopoda*, auctt.
- Terebratulina**, Giebel. *Brachiopoda*. 1846.
Palæoz. Fann. p. 121. Fam. Brach. cont. *Terebratula*, *Delthyris*, *Thecidea*, *Magas*, *Trigonotreta*, *Spirifer*, *Orbicula*.
- Terebratulina**, D'Orbigny. *Terebratulidæ*. 1847.
Comptes Rendus, xxv, p. 268. No ex. cited. D'Orb. Ann. Sci. Nat. viii, p. 249. Type *T. caputserpentis*, Lin. pl. vii, f. 7, 8, 17, 1848. Ib. xiii, p. 339, 1850. Dav. 1856, p. 121, pl. vi, f. 7-10, 24. Syn. *Agulhasia*, King.
- Terebratulina**, Dall. *Terebratulidæ*. 1879.
Am. Journ. Conch. vi, p. 99. Subfam. Brach. cont. *Terebratula*, *Reusselacriza*, *Terebratulina*, *Waldheimia*; with subgenera *Terebratula*, *Centronella*, *Epithyris*?, *Pygope*, *Waldheimia*, *Cryptonella*, *Meganteris*.
- Terebratulites**, auctt. *Arthropomata*.
Walch, Schröter, and others, used to denote fossil species of *Brachiopoda*.
- Terebratulites**, Schlotheim. *Arthropomata*. 1820.
Petref. p. 250, pl. 20, 37, 40. Sectio *Anomites*, cont. Brach. Arthrop. sp. foss.
- Terebrirostra**, D'Orbigny. *Terebratulidæ*. 1847.
Comptes Rendus, xxv, p. 268. No ex. cited. Pal. Franç. Ter. Cret. iv, p. 146, 1847. Type *Terebratula lyra*, Sow. = *Lyra Meadii*, Cumb. Ann. Sci. Nat. xiii, p. 345, 1850. Journ. de Conchyl. ii, p. 222, 1851. (= *Lyra*, Cumb.)
- Terebrirostris**, Gray. *Terebratulidæ*. 1848.
Ann. Mag. Nat. Hist. ii, p. 436; lapsus, = *Terebrirostra*, D'Orbigny.
- Thecidea**, D'Orbigny. *Arthropomata*. 1847.
Comptes Rendus, xxv, p. 269. Ibid. Cours Élém. Pal. p. 80, 1849. Fam. Brach. cont. *Megathiris*, *Thecidia*.
- Thecidea**, Gray. *Thecidiidæ*. 1848.
Ann. Mag. Nat. Hist. ii, p. 437; lapsus, = *Thecidea*, DeFr.
- Thecidea**, Gray. *Arthropomata*. 1848.
Ann. Mag. Nat. Hist. ii, p. 437. Fam. Brach. cont. *Thecidea*, *Argiope*.
- Thecidea**, D'Orbigny. *Arthropomata*. 1850.
Ann. Sci. Nat. xiii, p. 308. Fam. Brach. cont. *Thecidea*, *Megathiris*.
- Thecidea**, King. *Arthropomata*. 1850.
Perm. Foss. p. 81. Fam. Brach. cont. *Thecidea*.
- Thecidea**, Gray. *Arthropomata*. 1853.
Brit. Mus. Cat. Brach. p. 8. = *Thecidea*, D'Orb.
- Thecidea**, DeFrance. *Thecidiidæ*. 1828.
Ferussac, Tabl. Syst. p. 38 (1821?). Type *Terebratula punitum*, Lam. Hist. An. s. Vert. vii, p. 58, 1819. Dav. Ann. Mag. Nat. Hist. 1850, pl. xiv, f. 58. (Cret.) Syn. *T. radiata*, DeFr. l. c. (= *Thecidium*, Sow.)

- Thecidae**, Deshayes. *Arthropomata*. 1830.
Enc. Méth. iii, p. 553, tabl. Fam. Brach. cont. *Thecida*.
- Thecideidae**, Gray. *Arthropomata*. 1840.
Synopsis. Cont. Brit. Mus. i, p. 155; ii, pp. 85, 92. Fam. Brach. cont. *Thecida*. Adt. King, Ann. Mag. Nat. Hist. xviii, p. 28, 1846. Dav. 1853, p. 51. (Mel. *Thecidiidae*.)
- Thecideidae**, Davidson. *Arthropomata*. 1856.
Intr. p. 90. Subfam.? *Terebratulidae* cont. *Argiope* and subg. *Zellania*, *Stringocephalus*, and *Thecidium*.
- Thecidium**, Lacaze Duthiers. *Thecidiidae*. 1861.
Ann. Sci. Nat. Zool. xv, p. 262, pl. i-iv. *T. mediterraneum*, Sow. (= *Thecidium*, Sow.)
- Thecidiidae**, Dall. *Arthropomata*. 1870.
Am. Journ. Conch. vi, p. 147. Cat. Rec. Brach. Proc. Acad. Nat. Sci. Phil. 1872, p. 195. Fam. Brach. cont. *Thecidium*.
- Thecidiinae**, Dall. *Thecidiidae*. 1870.
Am. Journ. Conch. vi, p. 100. Subf. cont. *Thecidium*.
- Thecidioidae**, Agassiz. *Arthropomata*. 1847.
Nom. Zool. Index, p. 1061. = *Thecideade*, Gray corrig.
- Thecidium**, Sowerby. *Thecidiidae*. 1844.
Genera of Shells, xx. Dav. 1853, p. 77, pl. vi, f. 35-38. Type *Thecida radiata*, DeFr. = *T. pumilum*, Lam. (Cret.) Dav. l. c. (= *Thecida*, DeFr. corrig.)
- Trematis**, Sharpe. *Discinidae*. 1847.
Quart. Journ. Geol. Soc. London (June), iv, p. 66. Type *Orbicula terminalis*, Conrad, Nat. Hist. N. York, iv, Geol. by Emmons, p. 395, f. 4, 1842. Dav. 1856, pl. xiv, f. 4-7. (Trenton.) (Syn. *Orbicella*, D'Orb.)
- Trematospira**, Hall. *Spiriferidae*. 1857.
Pal. N. York, vol. iii, 1859, p. 207. 1st sp. mentioned l. c. pp. 207-9, *Spirifer? multistriatus*, Hall, Reg. Rep. 1856, Pal. N. York, iii, pl. 24, f. 3 a-t, pl. 28, f. 5 a-f. (Sil.) Cf. 12th Reg. Rep. (Oct. 1859), pp. 27-8, *T. multistriatus*, Hall, l. c. f. 3-4. (Comp. *Retzia*, King.) 1859.
- Tretenterata**, King. *Brachiopoda*. 1873.
Ann. Mag. Nat. Hist. 4th ser. xii, July, 1873, p. 15. Subclass cont. the inarticulate brach. (= *Lyopomata*, Owen.)
- Trigonella**, Quenstedt. *Terebratulidae*. 1871.
Petref. Deutschl. ii, p. 27, pl. 45, f. 1-2. Gen. Epithyrid. Type *Terebratula trigonella*, Schloth. Petref. 1820, p. 271, = *Trigonella suevica*, Schröter (non-binomial), fide Quenstedt, l. c. Not *Trigone'la*, Da Costa. (= *Eudesia*, King.)
- Trigonellæ**, Fischer de Waldheim. *Invertebrata*. 1809.
Notice Fos. Gouv. Moscon, p. 35. Sect. *Terebratulidarum*. Included some species of trigonal brachiopods. Not used in a strictly generic sense. (= *Trigonella*, Quenst. anct.)

- Trigonosema**, Paetel. *Terebratulidae*. 1875.
Fam. u. Gatt. Moll. p. 212; lapsus, = *Trigonosemus*, Kön.
- Trigonosemus**, König. *Terebratulidae*. 1825.
Icones Foss. Sectil. p. 3, pl. vi, f. 73. (Cret.) Type *T. elegans*, Kön.
l. e. fide Dav. 1856, p. 126, pl. vii, f. 6, 7, 8. Mon. Cret. Brach. p. 29, pl. iv, f. 1-4. Syn. *Fissurirostra*, D'Orb.
- Trigonosmus**, Paetel. *Terebratulidae*. 1875.
Fam. u. Gatt. Moll. p. 212; lapsus, = *Trigonosemus*.
- Trigonoremus**, Gray. *Terebratulidae*. 1848.
Ann. Mag. Nat. Hist. ii, p. 438; lapsus, = *Trigonosemus*.
- Trigorima**, Rafinesque. *Brachiopoda*. 1831.
Mon. Biv. Shells Ohio, p. 7. No ex. cited. Genus incert.
- Trigonotetra**, Davidson. *Spiriferidae*. 1856.
Intr. expl. pl. viii, f. 21. *Spirifera disjuncta*, Sow. Id. Keferstein, 1829. Zeit. Geogn. p. 85; lapsus, = *Trigonotreta*, Kön.
- Trigonotreta**, König. *Spiriferidae*. 1825.
Icones Foss. Sectiles, no. 70, p. 3. (Gen. cont. *Spirifer* sp. et *Orthis* sp. &c. fide Bronn.) Adt. King. Perm. Foss. pp. 81, 126, 1850. *T. stokesii*, Kön. l. e. selected as type; = (?) *Ter. aperturatus*, Schloth. Petref. i, p. 258, ii, p. 67, pl. 17, f. 1 (fide Bronn). (= *Spirifer*, Sow.)
- Trigonotreta**, Meek and Hayden. *Spiriferidae*. 1861.
Pal. Upper Missouri (Carb.), p. 19. Mr. Meek, having adopted *S. cuspidatus* as the type of *Spirifer*, revives *Trigonotreta*, König, to contain *Spirifer striatus*, Sow. (commonly regarded as the type,) and its congeners. (= *Spirifer*, Dav.)
- Trimecella**, "Dalman", Paetel. *Trimerellidae*. 1875.
Fam. u. Gatt. Moll. p. 212; lapsus, = *Trimerella*, Bill.
- Trimerella**, Billings. *Trimerellidae*. 1862.
Pal. Foss. Canada (Junc), p. 166, vol. i, f. 151, a-b. Type *T. grandis*, Bill. l. e. (Sil.) Dav. & King, Quart. Journ. Geol. Soc. May, 1874, p. 124, pl. xiii, f. 2, 3.
- Trimerellidae**, Davidson and King. *Lyopomata*. 1874.
Quart. Journ. Geol. Soc. London (May), p. 142. Fam. Brach. cont. *Trimerella*, *Monomerella*, *Dinobolus*.
- Triplasia**, Hall. *Rhynchonellidae*. 1859.
12th Reg. Rep. p. 44 (Oct.), f. 1-3. Type *T. extans*, Hall, l. c. = *Atrypa extans*, Emmons, Geol. Rep. 3d Distr. N. Y. 1843. (Ser. *Triplasia*.) Not *Triplasta*, Reuss, 1854, g. foramin. (Syn. *Dicraniscus*, Meek.)
- Tropidoleptus**, Hall. *Arthropomata*. 1857.
10th Regent's Rep. p. 151, f. 1-2. 12th do. p. 31, f. 1-4, 1859. Type *Strophomena carinata*, Conrad, Ann. Rep. Geol. N. York, 1839, p. 64; Hall, l. c. In notice Pal. N. York, vol. iv, p. 23, f. 1-2, Mar. 1867, this genus is pointed out as close to *Leptocoelia*, and probably belonging to the fam. *Terebratulidae*. (Dev.) (Comp. *Leptocoelia*, Hall, 1859.)

- Trunculites**, Rafinesque. *Brachiopoda*. 1831.
 Mon. Biv. Shells Ohio, p. 8. No ex. cited. Atlantic Journ. iii, p. 122, 1832. Name cited; no diagn. or ex. (*Gen. incert.*)
- Turbinolia**, auctt. non Lam. *Coelenterata*.
 A genus of zoophytes to which *Calecola* sp. and some brachiopods have been referred by authors.
- Uncinities**, auctt. *Brachiopoda*.
Cf. Uncites.
- Uncites**, DeFrance. *Spiriferidae*. 1825.
 Blainville, Man. Mal. p. 630. (Dev.) Type *Terebratulites gryphus*, Schlotheim, Dav. 1856, p. 173, pl. ix, f. 50-56.
- Uncitidae**, D'Orbigny. *Arthropomata*. 1849.
 Cours Élém. Pal. p. 80. Fam. Brach. cont. *Uncites*, *Atrypa*, *Pentamerus*.
- Ungula**, Pander. *Obolidae*. 1830.
 Beitr. Geogn. Russ. Reiches, pp. 55-7. 1st sp. *U. convexa*, Pand. p. 59, t. xxviii, f. 1. (L. Sil.) = *Obolus apollinis*, Eichw. (1829), Zool. Spec. i, p. 274, t. iv, f. 5. Dav. 1856, p. 245, pl. xiv, f. 35-39. Five out of six of Pander's sp. are stated by Bronn (Ind. Pal. iii, 1342) to be vars. of *O. apollinis*. The other sp. = *O. ingricus*, Eichw. l. c. p. 274. (= *Obolus*, Eichw.)
 Quenstedt notes (Petr. Deutschl. 1871, p. 669) that this genus was mentioned in Rose, "Reise nach dem Ural", the publication of which was begun by Engelhardt, of Dorpat, in the spring of 1829 (but not finished until 1837). Pander's work passed the censor in November, 1829, and was probably published by January, 1830. No sufficient evidence has yet been adduced to show that Pander's name preceded that of Eichwald, and if it stand at all (it seems as if several forms were included in Pander's very bad figures) it cannot be on the first species.
- Ungulites**, Bronn. *Obolidae*. 1848.
 Ind. Pal. iii, p. 1342. Quenst. 1871, Petr. Deutschl. p. 725 (? Wiegman). Arch. 1837, p. 143). Lapsus, (= *Ungula*, Pand.)
- Ungulites**, Quenstedt. *Trimerellidae*. 1871.
 Petref. Deutschl. ii, p. 669. Cont. *Diobolus*, sp. fide Dav. and King.
- Urticites**, auctt. *Invertebrata*. —.
 DeFrance, Dict. Sci. Nat. lvi, p. 383, 1823, in syn. (= *Hysteroolithus*, auctt.)
- Vitulina**, Hall. *Arthropomata*. 1860.
 13th Regent's Rep. p. 72 (Dec.), f. 1-2. No specific name applied. (Hamilton Gr.) Pal. N. York, iv, p. 410, pl. 62, f. 1, a-i. Sole ex. *V. pustulosa*, Hall, l. c. Not *Vitulina*, Swains. gen. Gasterop. 1840.
 Probably belongs to the *Terebratulidae*.

Volborthia, Möllera.*Siphonotretidae*. 1873.

(Extr.) Verh. Min. Ges. St. Petersburg, 1873, p. 1-7, pl. i, f. 1-6. (In Russian.) Type *Acrotreta recurra*, Kutorga, l. c. 1847, p. 277, t. vii, f. 9, 1848. *Hyalolithes* sp. Eichw. Leth. Ros. p. 905.

Waldheimia, King.*Terebratulidae*. 1850.

Perm. Foss. p. 81, 145. Type *Terebratula flavescens*, Lam. Hist. An. s. Vert. vi, p. 246, 1819, = *Waldheimia australis*, King, l. c. pl. xx, f. 10-12. Reeve, Conch. Icon. t. i; t. ii, f. 1 a-b. Cf. *Eudesia*, King.

This genus, or subgenus, which has come into very general use, and is represented by a number of recent species, most unfortunately bears a name which is preoccupied by Brullé, in *Hymenoptera*, since 1846. Brullé's genus is stated on good authority to be tenable, and hence the writer proposes to revive the name of *Eudesia* (which see) for this group. (Cf. Brullé, Hist. Nat. des Insectes Hym. iv, p. 665, Nov. 1846. Types *Tenthredo Brasiliensis*, Lep. St. Fargeau, and *W. Orbignyana*, Brullé, l. c. pl. 46, f. 8.)

Waltonia, Davidson.*Terebratulidae*. 1850.

Ann. Mag. Nat. Hist. p. 475. Type *W. Valenciennesii*, Dav. l. c. pl. xv, f. 1 a-d. Ib. l. c. 1852, p. 372, subg. *Magas*. Id. l. c. 1861, p. 34, olim. Founded on an immature and apparently imperfect *Terebratulid*; perhaps a *Terebratella*.

Zellania, Moore.*Terebratulidae*. 1854.

Proc. Somerset Archaeol. Nat. Hist. Soc. 1854.* Dav. 1856, p. 141, pl. vii, f. 43-44. Type *Z. Davidsonii*, Moore, l. c. (= *Cistella*, Gray.)

Zonarites, Rafinesque.*Brachiopoda*. 1831.

Enum. Rem. Obj. Cab. Raf. p. 4. Sole ex. *Z. atrata*, Raf. l. c. fos. Kentucky. (Genus incert.)

Zygospira, Hall,*Atrypidae*. 1862.

15th Regent's Rep. pp. 154-5, f. 1, 2. Type *Atrypa modesta*, (Say) Hall, l. c. (= *Stenocisma*, Hall, not Conr.)

SYSTEMATIC LIST OF THE GENERA.

Genera or subgenera admitted to be valid, or not sufficiently known to the author to be reasonably questioned, are printed in upright letters.

Synonymes, or names suspected to be such, are indented; absolute synonymes are in italics, the others in upright letters; both under the name to which they are referred, or suspected to belong.

An asterisk marks non-binomial synonymes.

An interrogation-mark (?) indicates that the family relations are doubtful. The same in parentheses (?) indicates that the synonyme so marked cannot be definitely referred to any genus, or may denominate an assemblage of species which should be distributed among several groups. Before a name not indented, it indicates a doubt as to its validity.

The name following a genus refers to the author who used it in the sense indicated by its allocation here, and not necessarily the author who first used it. This holds good throughout these lists.

It must be borne in mind that this arrangement is merely tentative and subject to reform.

Fam. TEREBRATULIDÆ.

(Terebratulinae.)

Terebratula, Müller.

* *Terebratula*, Llhwyd.

* *Sacculus*, Llhwyd.

* *Lampas*, Menschen.

* *Terebratulites*, Schlotheim.

Terebratularius, Dumeril.

Lampas, sp. Humphrey.

Gryphus, Megerle.

Lampus, Sowerby.

Musculus, Quenstedt.

Nucleata, Quenstedt.

(?) *Epithyris*, King, not Phillips.

Epithyrus, Paetel.

Seminula, McCoy, 1855.

Dielsma, King.

Centronella, Billings.

Cryptonella, Hall, 1861-3.

(?) *Rennseleria*, Hall.(?) *Leptocoelia*, Hall, 1859.

Pygope, Link.

* *Diphyites*, Schröter.

Pugites, De Haan.

Antinomia, Catullo.

(?) *Orthotoma*, Quenstedt.(?) *Vitulina*, Hall, not Swainson.

Terebratulina, D'Orbigny.

Agulbasia, King.

Cryptonella, Hall, 1867.

? *Cryptonema*, Bigsby.

Cryptocella, Paetel, not Adams.

Meganteris, Suess.

Endesia, (King) Dall.

Waldheimia, King, not Brullé.

Macandreria, King, not Gray.

(?) *Gwynia*, King.

Trigonella, Quenstedt.

Cincta, Quenstedt.

Cryptacanthia, White & St. John.

Lyra, Cumberland.

Terebrirostra, D'Orbigny.

Terebrirostris, Gray.

(*Magasinae*.)

Trigonosemus, König.

Trigonoemus, Gray.

Trigonosmus, Paetel.

Trigonosma, Paetel.

Fissirostra, D'Orbigny.

Fissurirostra, D'Orbigny.

Fissirostris, Gray.

Fissurirostra, Paetel.

Delthyridea, King.

Delthyrida, Davidson.

Delthyridea, Gray.

? *Hynniphoria*, Suess.

Hynniphoria, Bronn.

Terebratella, D'Orbigny.

Delthyris, Menke.

Ismenia, King.

Waltonia, Davidson.

Laqueus, Dall.

Megerlia, King, not Rob-Desv.

Megerlea, Davidson.

Orthis, Menke.

Orthis, Philippi.

(?) *Frenula*, Dall.

Ismucia, King, olim.

Ismucia, Gray, Dall.

Kingena, Davidson.

Magasella, Dall.

? *Tropidoleptus*, Hall.

Platidia, Costa.

Morrisia, Davidson.

Bouchardia, Davidson.

Pachyrhynchus, King.

Magas, Sowerby.

Majas, Keferstein.

Megas, Isensee.

(?) *Mannia*, Deswalque.

Rhynchokora, Dalman (pars).

Rhynchura, Agassiz.

Rhyncora, Gray.

Kraussina, Davidson.

Kraussia, Davidson.

Kraussinina, Paetel.

(*Megathyrina*.)

Megathyrus, Bronn.

Megathiris, D'Orbigny.

Argyope, Deslongchamps, not Savigny.

Argiope, Deslongchamps, not Savigny.

Cistella, Gray.

Zellania, Moore.

Fam. THECIDIIDÆ.

Thecidium, Sowerby.

Thecida, DeFrance.

Thecidava, Gray.

Thecidium, Lacaze Duthiers.

Fam. STRINGOCEPHALIDÆ.

Stringocephalus, Sandberger.

Strygocephale, Blainville.

Strygocephalus, Bronn.

Stringocephalus, DeFrance.

Fam. PENTAMERIDÆ.

Anastrophia, Hall.

Brachymerus, Shaler.

Amphigenia, Hall.

Gypidula, Hall.

Pentamerella, Hall.

Camarella, Billings (pars).

Camarella, Paetel.

Stenoschisma, n.

Stenocisma, Conrad, not Hall.

Camerochoria, King.

Camurophoria, Bronn.

Conerophoria, Gray.

Pentamerus, Sowerby.

Pentastere, Blainville.

Pentastera, Hermannsen.

Conehidium, Linné.

Gypidia, Dalman.

Gypidia, Hall.

Gypidium, Beyrich.

Stricklandia, Billings.

Stricklandina, Billings.

Syntrielasma, Meek.

Syntrielasma, Carpenter.

Fam. RHYNCHONELLIDÆ.

Rhynchonella, Fischer.

Rhynchonelle, Fischer.

Rhynogonella, Bronn.

* *Oryrhynchus*, Lihwyd.

Stenocisma, Hall, 1867.

Rhynchotrema, Hall.

Hypothyris, Phillips.

Hypothyris, King.

Cyclothyris, Davidson.

Bicorues, Quenstedt.

Acanthothyris, D'Orbigny.

Acanthothiris, D'Orbigny.

Hemithyris, Bronn.

Hemithiris, D'Orbigny.

Hypothyris, Forbes & Hanley.

Rhynchopora, King.

(?) Antirhynchonella, Quenstedt.

Camarella, Billings (pars typ.).

Camarella, Paetel.

Eatonia, Hall.

Etonia, Meek & Hayden.

Dimerella, Zittel.

Atretia, Jeffreys.

Cryptopora, Jeffreys.

(?) Rhynchonellina, Gemellaro.

Triplesia, Hall.

Dicraniscus, Meek.

Leiorhynchus, Hall, not Rud.

Meristella, Hall, olim 1862.

? Eichwaldia, Billings.

Dictyonella, Hall, MSS.

Fam. ATRYPIDÆ.

Atrypa, Dalman.

Spirigerina, D'Orbigny.

Cleiothyris, Phillips.

Cleidothyris, Paetel.

Cliothyris, Agassiz.

Anoplothea, Sandberger.

Zygospira, Hall.

Stenocisma, Hall, 1847, not Con.

(?) Coelospira, Hall.

Leptocoelia, Hall, 1857.

Koniuckina, Suess.

Koniuckia, Woodward.

? Davidsonia, Bouchard.

Fam. SPIELFERRIDÆ.

Athyris, McCoy.

Athyris, Davidson, 1856.

Seminula, McCoy, 1844.

Actinocouchus, McCoy.

Semiluna, King.

- Cleiothyris*, King.
Spirigera, D'Orbigny.
Euthyris, Quenstedt.
 (?) *Charionella*, Billings.
Merista, Suess.
 Camarium, Hall.
Pentagonia, Cozzens.
 Goniococlia, Hall.
Meristella, Hall, 1861.
 Athyris, Davidson, 1853.
 Athyris, Billings.
 (?) *Meristina*, Hall.
Nucleospira, Hall.
Retzia, King.
 Retsia, Davidson.
 Rhynchospira, Hall.
 Rhynospira, Hall.
 Trematospira, Hall.
Acambona, White.
 Eumetria, Hall.
Uncites, DeFrance.
 Uncinites, auctt.
Spirifer, Sowerby.
 Spirifera, J. de C. Sowerby.
 Spiriferus, Blainville.
 Spirifer, Rafinesque.
 Hysterolithus, Quenstedt.
 Fusella, M'Coy.
 Choristites, Fischer.
 Choristites, Quenstedt.
 Choristides, Keferstein.
 Delthyris, Dalman.
 Brachythyris, M'Coy.
 Trigonotreta, König, Meek.
 Trigonotetra, Keferstein.
 Reticularia, M'Coy.
Martinia, M'Coy.
 Ambococlia, Hall.
 Ambococlia, Quenstedt.
Syringothyris, Winchell.
 Spirifer, King, Meek.
Cyrtia, Dalman.
 Cyrthia, D'Orbigny.
Cyrtina, Davidson.
 Cyrtaena, Hall.
 (?) *Mentzelia*, Quenstedt.
Suessia, Deslongchamps.
Spiriferina, D'Orbigny.
 * *
 (?) *Skenidium*, Hall.

Fam. PORAMBONITIDÆ.

- Porambonites*, Pander.
 Priambonites, Agassiz.
 Isorhynchus, King.

Fam. STROPHOMENIDÆ.

- Strophomena*, Blainville.
 Hemipronites, Meek.
 Strophonema, Rang.
 Orthis, King, 1850.
 Leptaena, sp. Dalman.
 Strophomena, Davidson (pars).
Hipparionyx, Vanuxem.
 (?) *Orthothetes*, Fischer, 1837.
 Orthothetes, Fischer, 1850.
 Orthothetes, D'Orbigny.
 Orthotetes, Oken.
 Streptorhynchus, King.
 (?) *Plectambonites*, Pander.
 Leptaena, sp. Dalman.
 Leptaena, King, 1846.
 Strophomena, Meek, 1873.
 Leptagonia, M'Coy.
 Leptagonia, Agassiz.
Leptaena, Dalman (pars).
 Leptaena, Davidson.
 Plectambonites, King.
Strophodontia, Hall.
 Strophodontia, Hall.
 Strophodontia, Marschall.
Klitambonites, Pander.
 Pronites, Pander, not Illiger.
 Prionites, Agassiz.
 Clitambonites, Agassiz.
 Hemipronites, Pander.
 Hemiprionites, Agassiz.
 Gonambonites, Pander.
 Orthisina, D'Orbigny.
 Orthisina, Davidson.
Orthis, Davidson.
 Orthis, Dalman (pars).
 Orthambonites, Pander.
 Strophomenes, Steininger.
 Schizophoria, King.
 Platystrophia, King.
 Platistrophia, Quenstedt.
 (?) *Meekella*, White & St. John.
Bilobites, Linné.
 Dicaclosia, King.
Brachyprion, Shaler.
 (Doubtful.)
 ? *Amphielina*, Laube.
 ? *Aulacorhynchus*, Dittmar.
 ? *Enteleles*, Fischer.
 Entellites, Sowerby.
 Anteleles, D'Orbigny.
 ? *Ipbidea*, Billings.
 ? *Tropidoleptus*, Hall.
 ? *Skenidium*, Hall.

Fam. PRODUCTIDÆ.

Productus, Sowerby.

Producta, Sowerby, jr.*Producta*, McCoy.*Protonia*, Link.* *Pyxis*, Chemnitz.*Arbusculites*, Murray.*Arbusculites*, Paetel.

Chonetes, Fischer.

Leptacna, McCoy.*Chonetes*, Paetel.

Productella, Hall.

Strophalosia, King.

Strophalosia, Gray.*Strophalosia*, Brown.*Leptacnatosia*, King.*Orthothrix*, Geinitz.*Orthothrix*, Davidson.*Orthothrix*, auct.

Anlosteges, Hølmersen.

LYOPOMATA.

Fam. SIPHONOTRETIDÆ.

Siphonotreta, Verneuil.

Siphonotreta, Dana.

Mesotreta, Kutorga.

Acrotreta, Kutorga.

Volborthia, Möller.

? Eichwaldia, Billings.

? Iphidea, Billings.

Fam. TRIMERELLIDÆ.

Trimerella, Billings.

Trimerella, Paetel.*Gotlandia*, Dall.*Rhynobolus*, Hall.*Obolclina*, Billings.

Dinobolus, Hall.

Engulies, Quenstedt.*Conradia*, Hall.

Monomerella, Billings.

? Lingulops, Hall.

Fam. OBOLIDÆ.

Hølmersenella, Pander.

Keyserlingia, Pander.

? Kutorgina, Billings (pars).

Kutorgina, Davidson.

Monobolina, Salter.

Obolclia, Billings.

? Spondylobolus, McCoy.

Spondylobolus, Davidson.

Aulonotreta, Kutorga (pars).

Leptobolus, Hall.*Leptobolus*, Hall.*Aeritis*, Volborth.*Aerites*, Dav. & King.

Obolus, Eichwald.

Obolus, Quenstedt.*Ungula*, Pander.*Ungulites*, Brown.*Aulonotreta*, sp. Kutorga.

(?) Schmidtia, Volborth, not Bals.-Criv.

Dicellomus, Hall.

Fam. LINGULIDÆ.

Dignomia, Hall.

Lingulella, Salter.

Lingulepis, Hall.

Glottidia, Dall.

Glossina, Phillips.

Lingula, Brugière.

Ligula, Cuvier.*Ligularius*, Dumeril.*Ligularius*, Hermannsen.*Pharetra*, Bolten.

Fam. DISCINIDÆ.

Discina, Lamarck.

Orbicula, Sowerby.

Disciniscia, Dall.

Trematis, Sharpe.

Orbicella, D'Orbigny.

Orbiculoidea, D'Orbigny.

Shizotreta, Kutorga.*Shizotreta*, Davidson.

Schizocrania, Hall & Whitfield.

Fam. CRANIDÆ.

Crania, Retzius.

* *Criopoderma*, Poli.* *Criopiderma*, Poli.*Criopododerma*, Agassiz.*Criopus*, Gray.*Cryopus*, Deshayes.*Craniolites*, Schlotheim.*Craniolites*, auctt.*Discina*, Turton.* *Nummulus*, Waller.*Nannulus*, Agassiz.*Orbicula*, Cuvier.*Orbicularius*, Dumeril.

Craniscus, Dall.

Ancistrocrania, Dall.

Cranopsis, Dall, not Adams.

Pseudocrania, McCoy.

Cranops, Hall.*Pholidops*, Hall.*Palæocrania*, Quenstedt.

Choniopora, Schaueroth.

GENERA INCERTÆ SEDIS.

Mostly indeterminate and of Rafinesque.

Anablotrema, Rafinesque.

Amblytrema, Agassiz.

Aplecrotis, Paetel.

Apleurotis, Rafinesque.

**Bufocephalus*, Linné.

**Bursula*, Klein.

**Capsularia*, Lhlwyd.

Clipsilia, Rafinesque.

**Conchyolithus*, Martin.

Cranicella, Rafinesque.

Currentites, Rafinesque.

Cyclothyrus, McCoy.

Delthyrida, McCoy.

Diclipites, Rafinesque.

Dielisma, Rafinesque.

Discinella, Hall.

Epithyrus, Phillips.

Goniclis, Rafinesque.

Gonotrema, Rafinesque.

Hemiasterias, Hermannsen.

Hemisterias, Rafinesque.

Megarima, Deshayes.

Megarites, Rafinesque.

Megorima, Rafinesque.

Oborites, Rafinesque.

Orthothetes, Evans, 1829.

Orthothetes, Fischer, 1837.

Pachiloma, Rafinesque.

Pachyloma, Hermannsen.

**Peridiolithus*, Hüpsch.

Plachiloma, Ferussac.

Platilites, Rafinesque.

Pleuranis, Rafinesque.

Pleureterites, Bronn.

Pleureterites, Rafinesque.

Pleurinca, Rafinesque.

Strophesia, Rafinesque.

Strophomenes, Rafinesque.

Styrasis, Rafinesque.

Telestrophis, Agassiz.

Telastrophis, Rafinesque.

Trigorima, Rafinesque.

Trunculites, Rafinesque.

Zonarites, Rafinesque.

GENERA CONTAINING A HETEROGENEOUS ASSEMBLY, OF WHICH SOME SPECIES ARE KNOWN OR SUPPOSED TO HAVE BEEN BRACHIOPODS.

Anomia, Linné.

**Anomites*, Schlotheim.

**Bucardites*, Argenville.

Clavagella, Goldfuss.

**Ctenites*, Kennnman.

**Cunolites*, auctt.

**Gryphites*, Lhlwyd.

**Gryphytes*, Da Costa.

Helmintholithus, Linné.

Hipponyx, Morris.

**Hysterolites*, Schlotheim.

Hysterolithos, Link.

**Hysterolithos*, Grew.

**Hysterolithus*, Aldrovandus.

**Hysteropetra*, Cardan.

**Onychites*, Mercati.

**Ostracites*, Lhlwyd.

**Ostreoplectiniles*, auctt.

Patella, Linné.

**Pectiniles*, auctt.

**Pectinuli*, auctt.

**Pectunculites*, Gesner.

**Pectunculites*, Lister.

Pycnodonte, Fischer.

Siphonaria, Quenstedt.

**Stola*, Klein.

Trigonelles, Fischer.

**Trigonellites*, auctt.

**Urticites*, auctt.

GENERA ERRONEOUSLY REFERRED TO THE BRACHIOPODA.

ACEPHALA.

ANOMIIDÆ.

Ænigma, Koch.

CARDITIDÆ.

Orthonata, Emmons.

LUCINIDÆ.

Paracyclas, Hall.

CRUSTACEA.

ENTOMOSTRACA.

Daphnoidea, Hibbert.

COELENTERATA.

CALCEOLIDÆ.

Hypodema, Koninek.

Calceola, Lamarck.

* *Calcoates*, Schlotheim.* *Crepidites*, Schröter.* *Crepidolite*, Rozier.* *Crepidolithus*, Hüpsch.* *Crepite*, Rozier.* *Crepites*, Hüpsch.* *Pilolithus*, Benth.* *Sandaliolite*, Rozier.* *Sandalolithus*, Hüpsch.* *Sandalite*, Rozier.* *Sandalites*, Hüpsch.*Sandalium*, Oken.*Calceolaria*, Griffith.*Rhizophyllum*, Lindström.

? ?

Chelodes, (D. & K.) Lindström.

From the preceding list it appears that about four hundred and sixty-three generic and subgeneric names have been rightly or wrongly associated with the group of Brachiopoda. Eighty-seven have been assigned to the *Terebratulidæ*, sixty-five to the *Rhynchonellidæ* as generally understood, fifty-three to the *Spiriferidæ*, and fifty-two to the *Strophomenidæ*. Of all these, only about one hundred and thirty have been at all generally accepted, being about three and a half names to each group. Sixteen families and two orders are here recognized. The general list contains about seven hundred names. It is estimated that there are about ten thousand names and synonyms which have been used in the sub-kingdom of *Mollusca*, taken in its extended sense, of which the Brachiopods contribute about six per cent.

List of the Linnean species of Brachiopoda described in the Systema Naturæ, ed. X and XII, with their modern equivalents, chiefly on the authority of Sharpe, Hanley, and Davidson.

| Ed. | Linnean name. | Modern name. |
|-----|---------------------------------|---|
| X | <i>Anomia craniolaris</i> . | <i>Crania craniolaris</i> , Dall. |
| X | <i>Anomia pectinata</i> . | <i>Trigonosemus pectinatus</i> , Gray. |
| X | <i>Anomia scobinata</i> . | ? <i>Megerlia truncata</i> , Dav. |
| X | <i>Anomia aurita</i> . | ? <i>Terebratulina caputserpentis</i> , D'Orb. |
| X | <i>Anomia retusa</i> . | <i>Terebratulina caputserpentis</i> , D'Orb. |
| X | <i>Anomia pecten</i> . | <i>Strophomena pecten</i> , Dav. |
| X | <i>Anomia striata</i> . | ? |
| XII | <i>Anomia truncata</i> . | <i>Megerlia truncata</i> , Dav. |
| X | <i>Anomia reticularis</i> . | <i>Atrypa reticularis</i> , Dalman. |
| X | <i>Anomia plicatella</i> . | <i>Spirifer interlineatus</i> , Sowerby. |
| X | <i>Anomia crispa</i> . | <i>Spirifer sulcata</i> , Davidson. |
| X | <i>Anomia lacunosa</i> . | <i>Rhynchonella Wilsoni</i> , Sow. |
| XII | <i>Anomia pubescens</i> . | <i>Ter. caputserpentis</i> (juv.). |
| X | <i>Anomia farcta</i> . | <i>Terebratula obsoleta</i> , Sowerby. |
| XII | <i>Anomia caputserpentis</i> . | <i>Ter. caputserpentis</i> , D'Orbigny. |
| X | <i>Anomia terebratula</i> . | <i>Terebratula pectoralis</i> , Sowerby. |
| XII | <i>Anomia excavata</i> . | <i>Terebratula excavata</i> , Phillips. |
| X | <i>Anomia hystericita</i> . | <i>Orthis striatula</i> , Davidson. |
| XII | <i>Anomia spinosa</i> . | <i>Acanthothyris spinosa</i> , D'Orb. |
| X | <i>Anomia biloba</i> . | <i>Orthis (Bilobites) biloba</i> , Quenst. |
| X | <i>Conchidium bilocularis</i> . | <i>Gypidia conchidium</i> , Dalm. |
| X | <i>Patella unguis</i> . | <i>Lingula</i> + <i>Parmophorus</i> , sp. incert. |

Table showing approximately the known distribution of the chief groups of Brachyopoda in geological time—Continued.

| | Cambrian. | Silurian. | Devonian. | Carboniferous. | Permian. | Triassic. | Jurassic. | Cretaceous. | Tertiary. | Recent. |
|---|-----------|-----------|-----------|----------------|----------|-----------|-----------|-------------|-----------|---------|
| <i>Camarrella</i> , Billings (sp.) | . | — | . | . | . | . | . | . | . | . |
| <i>Anastrophia</i> , Hall | . | — | . | . | . | . | . | . | . | . |
| <i>Amphigenia</i> , Hall | . | . | — | . | . | . | . | . | . | . |
| <i>Gypidula</i> , Hall | . | . | — | . | . | . | . | . | . | . |
| <i>Pentamerella</i> , Hall | . | . | — | . | . | . | . | . | . | . |
| <i>Stenoschisma</i> , (Conrad). | . | . | ? | — | . | . | . | . | . | . |
| <i>Syntriplasma</i> , Meek. | . | . | . | — | . | . | . | . | . | . |
| | × | × | × | × | × | × | × | × | × | × |
| RHYNCHONELLIDÆ | | | | | | | | | | |
| ? <i>Eichwaldia</i> , Billings | . | — | . | . | . | . | . | . | . | . |
| <i>Eatonia</i> , Hall. | . | — | . | . | . | . | . | . | . | . |
| <i>Triplasia</i> , Hall. | . | — | . | . | . | . | . | . | . | . |
| <i>Antirhynchonella</i> , Quenstedt | . | — | . | . | . | . | . | . | . | . |
| <i>Camarrella</i> , Billings (pars) | . | — | . | . | . | . | . | . | . | . |
| <i>Rhynchonella</i> , Fischer | . | — | . | . | . | . | . | ? | . | . |
| <i>Leiorhynchus</i> , Hall, not Rud | . | . | — | ? | . | . | . | . | . | . |
| <i>Rhynchopora</i> , King | . | . | . | . | — | . | . | . | . | . |
| <i>Dimerella</i> , Zittel. | . | . | . | . | . | — | ? | ? | ? | — |
| <i>Rhynchonellina</i> , Gemellaro. | . | . | . | . | . | . | — | . | . | . |
| <i>Acanthothyris</i> , D'Orbigny. | . | . | . | . | . | . | — | . | . | . |
| <i>Hemithyris</i> , Broun | . | . | . | . | . | . | ? | — | — | — |
| | × | × | × | × | × | × | × | × | × | × |
| ATRYPIDÆ. | | | | | | | | | | |
| <i>Zygospira</i> , Hall | . | — | . | . | . | ? | . | . | . | . |
| <i>Coelospira</i> , Hall | . | — | . | . | . | . | . | . | . | . |
| <i>Atrypa</i> , Dalman | . | — | . | . | . | . | . | . | . | . |
| <i>Anoplotheca</i> , Sandberger | . | . | — | . | . | . | . | . | . | . |
| <i>Davidsonia</i> , Bonch | . | . | — | . | . | . | . | . | . | . |
| ? <i>Koninckina</i> , Suess. | . | . | . | . | . | — | . | . | . | . |
| | × | × | × | × | × | × | × | × | × | × |
| SPIRIFERIDÆ | | | | | | | | | | |
| ? <i>Skenidium</i> , Hall | . | — | . | . | . | . | . | . | . | . |
| <i>Meristina</i> , Hall (?) | . | — | . | . | . | . | . | . | . | . |
| <i>Meristella</i> , Hall, 1861. | . | — | . | . | . | . | . | . | . | . |
| <i>Merista</i> , Suess. | . | — | . | . | . | . | . | . | . | . |
| <i>Athyris</i> , McCoy | . | — | . | . | . | . | . | . | . | . |
| <i>Spirifer</i> , Sowerby. | . | — | . | . | . | . | . | . | . | . |
| <i>Cyrtia</i> , Dalman | . | — | ? | . | . | . | . | . | . | . |

Table showing approximately the known distribution of the chief groups of Brachiopoda in geological time—Continued.

| | Cambrian. | Silurian. | Devonian. | Carboniferous. | Permian. | Triassic. | Jurassic. | Cretaceous. | Tertiary. | Recent. |
|--|-----------|-----------|-----------|----------------|----------|-----------|-----------|-------------|-----------|---------|
| <i>Cyrtina</i> , Davidson | . | — | — | — | . | . | . | . | . | . |
| <i>Nucleospira</i> , Hall. | . | — | — | . | . | . | . | . | . | . |
| <i>Trematospira</i> , Hall | . | — | . | . | . | . | . | . | . | . |
| <i>Retzia</i> , King | . | — | — | — | . | . | . | . | . | . |
| <i>Acambona</i> , White | . | . | . | — | . | . | . | . | . | . |
| <i>Charionella</i> , Billings | . | . | — | . | . | . | . | . | . | . |
| <i>Pentagonia</i> , Cozzens. | . | . | — | . | . | . | . | . | . | . |
| <i>Uncites</i> , DeFrance. | . | . | — | . | . | . | . | . | . | . |
| <i>Spiriferina</i> , D'Orbigny. | . | — | — | — | — | — | — | — | — | — |
| { <i>Anbocoelia</i> , Hall | . | . | — | ? | . | . | . | . | . | . |
| { <i>Martinia</i> , M'Coy | . | . | — | — | . | . | . | . | . | . |
| <i>Syringothyris</i> , Winchell | . | . | . | — | . | . | . | . | . | . |
| <i>Suessia</i> , Deslongchamps | . | . | . | . | . | — | — | . | . | . |
| <i>Mentzelia</i> , Quenstedt | . | . | . | . | . | — | — | . | . | . |
| PORAMBONITIDÆ | × | × | × | × | × | × | × | × | × | × |
| <i>Porambonites</i> , Pander | . | — | — | — | — | — | — | — | — | — |
| STROPHOMENIDÆ | × | × | × | × | × | × | × | × | × | × |
| ? <i>Iphidea</i> , Billings | — | — | . | . | . | . | . | . | . | . |
| <i>Orthis</i> , Dalman | — | — | — | — | ? | . | . | . | . | . |
| <i>Platystrophia</i> , King | — | — | . | . | . | . | . | . | . | . |
| <i>Bilobites</i> , Linné | — | — | . | . | . | . | . | . | . | . |
| <i>Brachyprion</i> , Shaler. | — | — | . | . | . | . | . | . | . | . |
| <i>Stropheodonta</i> , Hall. | — | — | — | — | . | . | . | . | . | . |
| <i>Klitambonites</i> , Pander | — | — | ? | ? | ? | . | . | . | . | . |
| ? <i>Skenidium</i> , Hall | — | — | . | . | . | . | . | . | . | . |
| <i>Strophomena</i> , Blainville | — | — | — | — | ? | . | . | . | . | . |
| <i>Leptaena</i> , Dalman | — | — | — | — | — | — | — | — | — | — |
| <i>Streptorhynchus</i> , King | — | ? | — | — | — | . | . | . | . | . |
| <i>Hipparionyx</i> , Vanuxem | — | ? | — | ? | ? | . | . | . | . | . |
| <i>Merkella</i> , White & St. John | — | . | — | — | . | . | . | . | . | . |
| ? <i>Aulacorhynchus</i> , Dittmar | — | . | — | — | . | . | . | . | . | . |
| ? <i>Amphiclina</i> , Laube | — | . | . | . | . | — | . | . | . | . |
| PRODUCTIDÆ | × | × | × | × | × | × | × | × | × | × |
| <i>Chonetes</i> , Fischer. | — | — | — | — | — | . | . | . | . | . |
| <i>Strophalosia</i> , King | — | — | — | — | — | . | . | . | . | . |

Table showing approximately the known distribution of the chief groups of Brachiopoda in geological time—Continued.

| | Cambrian. | Silurian. | Devonian. | Carboniferous. | Permian. | Triassic. | Jurassic. | Cretaceous. | Tertiary. | Recent. |
|--|-----------|-----------|-----------|----------------|----------|-----------|-----------|-------------|-----------|---------|
| <i>Productus</i> , Sowerby. | . | . | | | | . | . | . | . | . |
| <i>Productella</i> , Hall | . | . | | | | . | . | . | . | . |
| <i>Aulosteges</i> , Heliwersen | . | . | . | . | | . | . | . | . | . |
| | x | x | x | x | x | x | x | x | x | x |
| SPHONOTRETIDÆ | | | . | . | . | . | . | . | . | . |
| <i>Acrotreta</i> , Kutorga | | | . | . | . | . | . | . | . | . |
| <i>Siphonotreta</i> , Verneuil | | | . | . | . | . | . | . | . | . |
| <i>Mesotreta</i> , Kutorga | | | . | . | . | . | . | . | . | . |
| <i>Vollborthia</i> , Möller | . | . | . | . | . | . | . | . | . | . |
| | x | x | x | x | x | x | x | x | x | x |
| TRIMERELLIDÆ | | | . | . | . | . | . | . | . | . |
| <i>Trimerella</i> , Billings | | | . | . | . | . | . | . | . | . |
| <i>Dinobolus</i> , Hall | | | . | . | . | . | . | . | . | . |
| <i>Monomerella</i> , Billings | | | . | . | . | . | . | . | . | . |
| ? <i>Lingulops</i> , Hall | . | . | . | . | . | . | . | . | . | . |
| | x | x | x | x | x | x | x | x | x | x |
| OBOLIDÆ | | | . | . | . | . | . | . | . | . |
| <i>Spondylobolus</i> , McCoy | | | . | . | . | . | . | . | . | . |
| <i>Monobolina</i> , Salter | | | . | . | . | . | . | . | . | . |
| <i>Kutorgina</i> , Billings | | | . | . | . | . | . | . | . | . |
| <i>Obolella</i> , Billings | | | . | . | . | . | . | . | . | . |
| <i>Obolus</i> , Eichwald | . | | . | . | . | . | . | . | . | . |
| <i>Aulonotreta</i> , Kutorga (pars). | . | | . | . | . | . | . | . | . | . |
| <i>Heliwersenia</i> , Pander | | | . | . | . | . | . | . | . | . |
| <i>Keyserlingia</i> , Pander | | | . | . | . | . | . | . | . | . |
| <i>Dicellomus</i> , Hall | . | | . | . | . | . | . | . | . | . |
| | x | x | x | x | x | x | x | x | x | x |
| LINGULIDÆ | | | . | . | . | . | . | . | . | . |
| <i>Lingulella</i> , Salter | | . | . | . | . | . | . | . | . | . |
| <i>Lingulepis</i> , Hall | | . | . | . | . | . | . | . | . | . |
| <i>Glossina</i> , Phillips | | | . | . | . | . | . | . | . | . |
| <i>Lingula</i> , Brugière | | | . | . | . | . | . | . | . | . |
| <i>Dignomia</i> , Hall | . | | ? | . | . | . | . | . | . | . |
| <i>Glottidia</i> , Dall | . | . | . | . | . | ? | ? | ? | . | . |
| | x | x | x | x | x | x | x | x | x | x |
| DISCINIDÆ | | | . | . | . | . | . | . | . | . |
| <i>Disciniscia</i> , Dall | | | . | . | . | . | . | . | . | . |
| <i>Schizocrania</i> , Hall & Whitfield | | | . | . | . | . | . | . | . | . |

Table showing approximately the known distribution of the chief groups of Brachiopoda in geological time—Continued.

| | Cambrian. | Silurian. | Devonian. | Carboniferous. | Permian. | Triassic. | Jurassic. | Cretaceous. | Tertiary. | Recent. |
|---|-----------|-----------|-----------|----------------|----------|-----------|-----------|-------------|-----------|---------|
| <i>Trematis</i> , Sharpe | . | — | . | . | . | . | . | . | . | . |
| <i>Orbiculoidea</i> , D'Orbigny | . | . | . | . | . | . | — | . | . | . |
| <i>Discina</i> , Lamarek | . | . | . | . | . | . | ? | ? | . | . |
| | x | x | x | x | x | x | x | x | x | x |
| CRANIDÆ | . | — | — | — | — | — | — | — | — | — |
| ? <i>Pseudocrania</i> , McCoy | . | — | . | . | . | . | . | . | . | . |
| <i>Crania</i> , Retzius | . | ? | — | — | — | — | — | — | — | — |
| <i>Choniopora</i> , Schauroth | . | . | . | — | . | . | . | . | . | . |
| <i>Craniscus</i> , Dall | . | . | . | . | . | — | — | . | . | . |
| <i>Ancistrocrania</i> , Dall | . | . | . | . | . | . | — | — | . | . |

Table of the geological distribution of the known families.

| | Cambrian. | Silurian. | Devonian. | Carboniferous. | Permian. | Triassic. | Jurassic. | Cretaceous. | Tertiary. | Recent. |
|-----------------------------------|-----------|-----------|-----------|----------------|----------|-----------|-----------|-------------|-----------|---------|
| LYOPOMATA. | | | | | | | | | | |
| <i>Cranidæ</i> | . | — | — | — | — | — | — | — | — | — |
| <i>Discinidæ</i> | — | — | — | — | — | — | — | — | — | — |
| <i>Lingulidæ</i> | — | — | — | — | — | — | — | — | — | — |
| <i>Trimerellidæ</i> | . | — | . | . | . | . | . | . | . | . |
| <i>Siphonotretidæ</i> | — | — | . | . | . | . | . | . | . | . |
| <i>Obolidæ</i> | — | — | . | . | . | . | . | . | . | . |
| ARTHRUPOMATA. | | | | | | | | | | |
| <i>Strophomenidæ</i> | — | — | — | — | — | — | — | . | . | . |
| <i>Productidæ</i> | . | — | — | — | — | . | . | . | . | . |
| <i>Spiriferidæ</i> | — | — | — | — | — | — | — | . | . | . |
| <i>Atrypidæ</i> | — | — | — | ? | ? | . | . | . | . | . |
| <i>Pentameridæ</i> | — | — | — | — | — | . | . | . | . | . |
| <i>Rhynchonellidæ</i> | — | — | — | — | — | — | — | — | — | — |
| <i>Porambonitidæ</i> | — | — | . | . | . | . | . | . | . | . |
| <i>Terebratulidæ</i> | — | — | — | — | — | — | — | — | — | — |
| <i>Stringocephalidæ</i> | . | . | — | . | . | . | . | . | . | . |
| <i>Thecid'idæ</i> | . | . | . | ? | ? | — | — | — | — | — |

It is seen that of sixteen families, six have living representatives, one more than appear to have been represented during the Cambrian epoch; while but two of the Cambrian families have survived. All those living in Cretaceous times have endured till now. All now living had Paleozoic representatives, while half the Paleozoic families do not appear to have survived the changes which introduced the Mesozoic time.

ADDENDA.

(December, 1877.)

Acrothele, Linnarson. *Discinidae*. 1876.

Bihang till K. Svensk. Vet. Ak. Handl. iii, No. 12, p. 20. 1st sp. *A. coriacea*, Linnarson. l. c. p. 21, pl. iv, f. 44-45. (Cambrian.) Comp. *Mesotreta*, Kutorga. Much like typical *Discina*.

Agilops, Hall. ? *Brachiopoda*. 1850.

Third Regent's Rep. App. K. p. 171; sole ex. *A. subcarinata*, Hall, l. c. pl. 4, f. 1 a-b. (Trenton.) A squeezed indeterminate cast, described (inferentially) as a Lamellibranch, but referred to Brachiopoda by Miller, Am. Pal. Fos. p. 103, 1877; no diagnosis; *incert. sedis*.

Lysingothyris, Hall. *Spiriferidae*. 1868.

Twentieth Reg. Rep. p. 388, note; *lapsus* = *Syringothyris*, Winchell.

Orthoidea, Friren (?). *Incert. sedis*. 1875.

Bull. Soc. Nat. Hist. de Metz, 1875, p. 22, pl. i, ii. (Middle Lias.) *O. liasina*, Fr. n. s. Quoted as a Brach. in Geol. Rec. for 1875, index of n. s. p. 351.

Pronites.

This term, as used by Illiger, was spelled *Prionites*. This does not, however, affect the synonymy in Brachiopods.

Rhizophyllum, Lindström. *Coelenterata*.

Dr. Lindström is convinced that this is distinct from *Calceola*.

Suessia, Deslongchamps. *Spiriferidae*. 1854.

First published by Dav. l. c. (See p. 69.) Afterward in Ann. Inst. Prov. 1855 (not 1854); extras, p. 6, f. 8-11, 12-16. 1st sp. *S. imbricata*, Suess, l. c.

Trematis, Sharpe. *Discinidae*. 1847.

Page 73, instead of "Type" read "1st sp. l. c. p. 68, f. 1-3," *Orbicula terminalis*, etc.

Department of the Interior:

U. S. NATIONAL MUSEUM.

— 9 —

BULLETIN

OF THE

UNITED STATES NATIONAL MUSEUM.

No. 9.

PUBLISHED UNDER THE DIRECTION OF THE SMITHSONIAN INSTITUTION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1877.

ADVERTISEMENT.

This work is the ninth of a series of papers intended to illustrate the collections of natural history and ethnology belonging to the United States and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

JOSEPH HENRY,

Secretary of the Smithsonian Institution.

SMITHSONIAN INSTITUTION,

Washington, May, 1877.

CONTRIBUTIONS
TO
NORTH AMERICAN ICHTHYOLOGY.

BASED PRIMARILY ON THE
COLLECTIONS OF THE UNITED STATES NATIONAL MUSEUM.

I.

REVIEW OF RAFINESQUE'S MEMOIRS ON NORTH AMERICAN FISHES

BY
DAVID S. JORDAN.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1877.

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PREFACE.

The purpose of this paper is to present a series of identifications of the species of fresh-water fishes described by Rafinesque in his "*Ichthyologia Ohiensis*" and elsewhere, made as a result of nearly three years of "field-work" in the region fished in by Rafinesque. In most cases, fresh specimens have been carefully compared with Rafinesque's accounts, and in the more difficult groups, as the *Cyprinidae*, *Catostomidae*, and *Centrarchidae*, I have taken a full series of the species known to occur in this region and compared Rafinesque's description with each specimen in turn, until one was reached which showed no serious discrepancy.

It is evident that many of Rafinesque's descriptions were drawn up from memory, and that his measurements were made by the eye, without the restraint of a tape-line. He indeed somewhere states that his collections were made in the summer and accounts written up for publication during the winter. As a result of this, the descriptions are often inexact, although usually striking. The numerous misprints in his work are also, in some cases, a source of confusion.

By making due allowance for these facts, and keeping in mind the proposition, unjustly controverted by some writers, that Rafinesque was not altogether a knave nor a fool, I have succeeded in identifying more or less satisfactorily, nearly all of his species, and in restoring to a number of his names their rightful priority.

The species still remaining unidentified are of two sorts: First, species really existing but not distinctively described, as *Luxilus interruptus*, *Rutilus compressus*, etc., in which no really tangible characters are given; and, second, those like *Aplocentrus calliops* and *Pogostoma leucops*, described at second hand from "drawings by Mr. Audubon", presenting, a grouping of characters applicable to no known fish.

It is not my purpose here to enter into any discussion of the merits of Rafinesque's work. That the *Ichthyologia* has been, and still is, a stumbling-block, is generally admitted. This is partly owing to errors of observation on the part of the author, partly to the admixture of statements derived from memory, imagination, or hearsay with statements of fact, and, finally, in no slight degree to the fact that Rafinesque's

accounts were taken from living fishes, and hence were not to be readily interpreted by workers in the closet with preserved specimens.

In order to do justice to Rafinesque's work, it is necessary, in the words of Girard (Proc. Ac. Nat. Sc. Phil. 1856, 167), "that one should go to the very ground trodden by Rafinesque himself, his book in hand, during all seasons of the year, aye, even for years in succession, to enable us to discriminate between what Rafinesque really observed and what is imaginary".

Rafinesque's work has been well summed up by Professor Agassiz:

"Nothing is more to be regretted for the progress of natural history in this country than that Rafinesque did not put up somewhere a collection of all the genera and species he had established, with well-authenticated labels, or that his contemporaries did not follow in his steps, or at least preserve the tradition of his doings, instead of deerying him and appealing to foreign authority against him. Tracing his course as a naturalist during his residence in this country, it is plain that he alarmed those with whom he had intercourse, by his innovations, and that they preferred to lean upon the authority of the great naturalists of the age, then residing in Europe, who, however, knew little of the special natural history of this country, than to trust a somewhat hasty man who was living among them, and who had collected a vast amount of information from all parts of the States, upon a variety of objects then entirely new to science. From what I can learn of Rafinesque, I am satisfied that he was a better man than he appeared. His misfortune was his prurient desire for novelties and his rashness in publishing them, and yet both in Europe and America he has anticipated most of his contemporaries in the discovery of new genera and species in those departments of science which he has cultivated most perseveringly, and it is but justice to restore them to him, whenever it can be done". (Am. Journ. Sc. Arts, 1854, p. 354.)

In regard to the descriptions of fishes made by Rafinesque from "drawings by Mr. Audubon", I am informed by Dr. Kirtland, on the excellent authority of Dr. Bachman, that several of the monsters described by Rafinesque (such as *Aplocentrus*, *Pogostoma*, *Eurystomus*, etc.) were drawn by Audubon with a view to a practical joke on the too credulous ichthyologist. That being the case, it is but justice to Rafinesque's memory to let those names drop from our systematic lists without prejudice to him.

The work known as the "Ichthyologia Obiensis" was originally published as a serial in the "Western Review and Miscellaneous Magazine", Lexington, Ky., from December, 1819, to November, 1820. This fact of publication by parts should be kept in mind, as, in one case at least (that of *Aplesion*), it may affect our nomenclature.

The following are the dates of publication, for which I am indebted to Professor Gill :

| Vol. | No. | Date. | W. R. & M. M. | I. O. |
|------|-------|--------------------------|---------------|--------------|
| | | | <i>Page.</i> | <i>Page.</i> |
| I. | I. | December, 1819 | 305-313 | 1-13 |
| | II. | January, 1820 | 361-377 | 13-29 |
| | III. | February (?), 1820 | ?-57 | ?-37 |
| II. | IV. | April, 1820 | 169-177 | 37-45 |
| | V. | May, 1820 | ?-243 | 45-53 |
| | VI. | June, 1820 | 299-307 | 53-60 |
| | VII. | July, 1820 | 355-363 | 61-69 |
| III. | VIII. | October, 1820 | 165-173 | 69-77 |
| | IX. | November, 1820 | 244-252 | 77-84 |

Quite a number of genera and species of American fresh-water fishes were described by Rafinesque in other publications previous to the appearance of the Ichthyologia. I give a list of all these known to me, with identifications. I exclude all names merely catalogued without explanation, as having no claims upon our attention. In some cases, a species was catalogued under one name and finally described under some other.

I have next inserted a complete catalogue of Rafinesquian genera, arranged in chronological order, with their equivalents in the nomenclature which I at present adopt.

The body of this paper consists of a list of the genera, subgenera, and species of the Ichthyologia, arranged in the sequence adopted by Rafinesque, with the names, English, Latin, and French, as he gave them, the misprints corrected by him in the "Errata" being here rectified. The page in the Ichthyologia in which each description occurs is added for the benefit of compilers of synonymy. Next comes my identification, with a partial synonymy of the species, the name which I adopt being printed in capitals. In a subsequent paper on the fishes of the Ohio Basin, the synonymy will be given in full, for which reason I have preferred not to insert it here.

In all cases where the recognition of Rafinesque's genera or species will render necessary a change in the current nomenclature, I have added Rafinesque's description as a foot-note, that the reader may see the grounds on which the identification is based. In such cases, I have usually italicized the salient points.

Finally, a list of the species now found in the valley of the Ohio, which do not appear to have been known to Rafinesque, completes the memoir.

This paper was originally prepared for the press in the spring of 1876. Most of the changes in nomenclature here discussed have been adopted by the author in different papers on fishes, and they have generally received the sanction of American workers in ichthyology. The manuscript of the paper has been since retouched, some untenable positions have been abandoned, and some further changes suggested by Professors Cope and Gill have been introduced.

I.—LIST OF RAFINESQUIAN GENERA AND SUBGENERA, WITH THEIR EQUIVALENTS IN THE ADOPTED NOMEN- CLATURE.

I give here a catalogue in chronological order of the generic and sub-generic names proposed by Rafinesque for our fresh-water fishes, with the type of each where any type is either designated or in any definite way implied, with its equivalence in the nomenclature which the writer at present adopts. The reasons for the use or non-use of these names will appear farther on. Those names originally proposed for subgenera are designated by a star (*).

| Rafinesquian genera. | Type species. | Modern genera. |
|----------------------|---------------|--|
| | 1818. | |
| Notropis | atherinoides. | Nototropis (= <i>Minnilus</i> = <i>Alburnellus</i>). |
| Glossodon | harengoides. | Hyodon. |
| Litholepis | adamantinus. | Litholepis (<i>Atractosteus</i>). |
| Dinoctus | truncatus. | Acipenser L. |
| Pogostoma | leucops. | A myth! |
| Pomoxis | annularis. | Pomoxys. |
| Noturus | flavus. | Noturus. |
| Sarchirus | vittatus. | Lepidosteus. |
| Exoglossum | lesurianum. | Exoglossum. |
| Maxillingua* | lesurianum. | Exoglossum. |
| Hypentelium* | macropterus. | Hypentelium (<i>Hylomy-</i> <i>zon</i> Ag.). |

1819.

| | | |
|-------------|--------------|--|
| Aplodinotus | grunniens. | Haploidonotus. |
| Etheostoma | flabellaris. | Etheostoma (<i>Catono-</i> <i>tus</i>). |
| Leucops | leucops. | A myth! |
| Aplocentrus | calliops. | A myth! |
| Calliurus | punctulatus. | Micropterus. |
| Lepomis | auritus L. | Lepiopomus. |
| Pomotis* | auritus L. | Lepiopomus. |

10 CONTRIBUTIONS TO NORTH AMERICAN ICHTHYOLOGY—I.

| Rafinesquian genera. | Type species. | Modern genera. |
|----------------------|---|---|
| Apomotis * | cyanellus. | Apomotis. |
| Notemigonus | auratus. | Notemigonus (<i>Stilbe</i>). |
| Amphiodon | "alveoides" (alosoides). | Hyodon. |
| Ambiodon | bubalus (teeth of <i>grun-</i> <i>niens</i>). | Ichthyobus and Haplo- donotus. |
| Cycleptus | nigrescens. | Cycleptus. |
| Pyloodictis | limosus. | Pelodichthys (<i>Hoplade-</i> <i>lus</i>). |

1820.

| | | |
|------------------|------------------------------|---|
| Stizostedion * | salmouea. | Stizostethium |
| Lepibema * | chrysops. | Roccus Mitchill, 1817. |
| Pomacampsis * | nigropunctata. | Stizostethium. |
| Iethelis | auritus L. | Lepiopomus. |
| Telipomis * | — | Apomotis (<i>Bryttus</i> C. & V.). |
| Aplites * | pallida. | Micropterus Lac. |
| Nemocampsis * | flexuolaris. | Micropterus Lac. |
| Dioplites * | salmonea. | Micropterus Lac. |
| Ambloplites * | ictheloides. | Ambloplites. |
| Aplesion * | calliura. | Micropterus Lacép. |
| Diplesion * | blennioides. | Diplesium (<i>Hyostoma</i> Ag., 1854). |
| Pomolobus | chrysocloris. | Pomolobus. |
| Dorosoma | notata. | Dorysoma (<i>Chatoëssus</i> Cuv. & Val., 1829). |
| Clodalus * | clodalus (Le S.) | Hyodon Le S. |
| Minnilus | — | Nototrepis. |
| Alburnus | alburnus L. (Euro- pean). | Alburnus (Heckel emend., 1843). |
| Phoxinus | phoxinus L. (Euro- pean). | Phoxinus (Agassiz emend., 184-). |
| Dobula | dobula L. (European). | ? Squalius Bonaparte, 1841. |
| Hemiplus (181-). | — (European?). | —. |
| Luxilus | chrysocephalus. | Luxilus (<i>Hypsilepis</i> Baird, 1854). |

| Rafinesquian genera. | Type species. | Modern genera. |
|----------------------|------------------------|------------------------------------|
| Chrosomus | erythrogaster. | Chrosomus. |
| Semotilus | dorsalis. | Semotilus. |
| Rutilus | rutilus L. (European). | Leuciscus Klein, 17—. |
| Plargyrus | rutilus L. | Lenciscus. |
| Pimephales | promelas. | Pimephales. |
| Moxostoma * | anisurus. | Myxostoma (<i>Ptychostomus</i>). |
| Ictiobus * | bubalus. | Ichthyobus. |
| Carpiodes * | ———— | Carpiodes. |
| Teretulus * | ———— | Myxostoma. |
| Eurystomus * | megastomus. | ? A myth. |
| Decactylus * | ———— | Catostomus, etc. |
| Cycleptus | nigrescens. | Cycleptus. |
| Ictalurus * | ———— | Ichthæurus. |
| Ellipsis * | maculatus. | Ichthæurus. |
| Ameiurus * | ———— | Amiurus. |
| Illetis * | limosus. | Pelodichthys. |
| Leptops * | viscosus. | Pelodichthys. |
| Opladelus * | nebulosus. | Pelodichthys. |
| Picorellus * | vittatus. | Esox. |
| Cylindrosteus * | platostomus. | Lepidosteus. |
| Atractosteus * | ferox. | Litholepis, 1818. |
| Sturio * | ———— | Acipenser L. |
| Sterletus * | serotinus. | Acipenser L. |
| Dinctus | truncatus. | Acipenser L. |
| Pegedictis | ictalops. | Etheostoma (<i>Catanotus</i>). |
| Proceros | maculatus. | A myth. |

II.—LIST OF SPECIES DESCRIBED PRIOR TO THE ICHTHY- OLOGIA OHIENSIS.

I give here a list of the papers known to me in which descriptions by Rafinesque, prior to those in the *Ichthyologia*, occur, with the names of the species so described, the page on which the descriptions occur, and my identification of the species.

* I. "Précis des Découvertes Somnologiques", 1814:

Sparus mocasinus 19=*Eupomotis aureus* (Walb.) G. & J.

Centropomus albus 19=*Morone americana* (Gmel.) Gill.

Centropomus luteus 19=*Perca americana* Schrank.

II. Dissertation on Water Snakes, Sea Snakes and Sea Serpents.
 < American Monthly Magazine and Critical Review, September, 1817:

Anguilla gigas 434=A myth.

III. First Decade of new North American Fishes. < American Monthly Magazine and Critical Review, December, 1817:

Anguilla chrispa..... 120=*Anguilla vulgaris* Fleming.

Salmo pallidus 120=*Salmo namaycush* Bloch.

Bodianus rupestris.... 120=*Ambloplites rupestris* (Raf.) Gill.

Bodianus aebigan..... 120=*Micropterus salmoides* (Lac.) Gill.

Cyprinus bullaris..... 120=Leucosomus bullaris (Raf.) Jor.
(Semotilus argenteus Auct.)

Cyprinus hemiplus.... 121=*Notemigonus americanus* (L.) Jor.

Cyprinus vittatus..... 121=*Rhinichthys atronaso* (Mit.) Ag.

Cyprinus megalops. . . 121=*Luxilus cornutus* (Mit.) Jor.

Cyprinus melanurus... 121=*Luxilus cornutus* (Mit.) Jor.

IV. Description of two new Genera of North American Fishes, Opsanus and Notropis. <American Monthly Magazine, January, 1818:

Notropis atherinoides.. 204=Nototropis sp. (*Minnilus* Raf.=*Alburnellus* Grd.).

V. Second Decade of new North American Fishes. ' < American Monthly Magazine, January, 1818:

Perca mucronata..... 204=*Morone americana* (Gmel.) Gill.

Perca notata 205 = *Perca americana* Schrank (= *Perca
flavescens* Auct.)

Petromyzon leucopterus 205=*Ammocætes nigricans* (Le S.) Gill.

Sparus erythropterus..... 205 (Erroneous and unidentifiable.)

* I have been unable to obtain this paper. Professor Gill informs me that two or three other American species are described in it, among them *Perca americana* Schranck.

VI. Discoveries in Natural History, made during a Journey through the Western Region of the United States by Constantine Samuel Rafinesque, esq. Addressed to Samuel L. Mitchill, President, and other members of the Lyceum of Natural History in a letter dated at Louisville, Falls of the Ohio, 20th July, 1818. <American Monthly Magazine and Critical Review, September, 1818. *(Twenty-six species recorded, the following described at some length:)

- Glossodon harengoides. 354=Hyodon tergisus Le Sueur.
 Glossodon heterurus... 354=Hyodon tergisus Le Sueur.
 Perca salmonea..... 354=Stizostethium salmoneum Raf.
 Sciaena caprodes..... 354=Percina caprodes (Raf.) Grd.
 Silurus punctatus..... 354=Ichthæurus punctatus (Raf.) Jor.
 Silurus olivaris... . . . 354=Pelodichthys olivaris (Raf.) Gill
 & Jor.
 Catostomus bubalus... 354=Ichthyobus bubalus Raf.
 Catostomus erythrurus. 354=Myxostoma duquesnii (Le S.) Jor.
 Clupea heterurus..... 354=Dorysoma cepedianaheterura (Raf.)
 Jor.

* The following is the catalogue as given in this paper:

| | |
|-------------------------------|------------------|
| Perca salmonea | Salmon. |
| Perca chrysops | Rockfish. |
| Sciaena grunniens | White Perch. |
| Sciaena caprodes | Hog Fish. |
| Bodianus callurus | Bass. |
| Sparus cyanelus | Sun Fish. |
| Sparus nigropunctatus | Bachelor Perch. |
| Silurus punctatus | Mud Cat Fish. |
| Silurus olivaris | Yellow Cat Fish. |
| Silurus amblodon | Black Cat Fish. |
| Catostomus bubalus | Buffaloe Fish. |
| Catostomus erythrurus | Red Horse. |
| Catostomus macropterus | Carp. |
| Catostomus duquesnei | Sucker. |
| Clupea heterurus | Gizzard. |
| Clupea alosoides | Shad. |
| Glossodon harengoides | Spring Herring. |
| Glossodon heterurus | Summer Herring. |
| Hydrargyra dinema | Minny. |
| Hydrargyra notata | Chub. |
| Hydrargyra amblops | White Chub. |
| Lepisosteus fluviatilis | Gar Fish. |
| Polyodon folium | Shovel Fish. |
| Polyodon pristis | Spade Fish. |
| Acipenser platyrhynchus | Sturgeon. |
| Silurus pallidus | White Cat. |

Not seen yet: Pike, Eels, Lamprey, Black Perch, Yellow Perch, Red Perch.

VII. Further discoveries in Natural History, made during a journey through the Western Region of the United States, by Constantine Samuel Rafinesque, esq. <American Monthly Magazine and Critical Review, October, p. 445. (Describes new genera *Litholepis*, *Dinoctus* and *Pogostoma*, and mentions without description the typical species of each.)

Twenty-two species are catalogued and three species are described, as follows:*

| | | |
|---------------------------------|------|-----------------------------------|
| <i>Anguilla laticauda</i> | 445= | <i>Anguilla vulgaris</i> Fleming. |
| <i>Esox vittatus</i> | 445= | Unidentified. |
| <i>Bodianus calliops</i> | 445= | A myth. |

VIII. Further account of Discoveries in Natural History in the Western States, by Constantine Samuel Rafinesque, esq. Communicated in a letter from that gentleman to the editor, Lexington, October 5, 1818. <American Monthly Magazine and Critical Review, November, 1818. (Three new genera described and the typical species of each:)

| | | |
|---------------------------------|-----|------------------------------------|
| <i>Pomoxis annularis</i> | 41= | <i>Pomoxys annularis</i> . |
| <i>Noturus flavus</i> | 41= | <i>Noturus flavus</i> Raf. |
| <i>Sarchirus vittatus</i> | 41= | <i>Lepidostens osseus</i> (L.) Ag. |

* The following are the species added to the catalogue in this paper:

| | |
|--|-----------------------------|
| <i>Lepisosteus platostomus</i> | Alligator Fish. |
| <i>Lepisosteus stenorhynchus</i> | Gar Fish. |
| <i>Anguilla laticauda</i> | Ohio Eel. |
| <i>Cyprinus fasciolaris</i> | Mullet. |
| <i>Cyprinus trachiaphas</i> | Brown Mullet. |
| <i>Exoglossum argenteum</i> | White Chub. |
| <i>Olmerus albula</i> | White Fish. |
| <i>Bodianus calliops</i> | Bride Perch. |
| <i>Pogostoma leucops</i> | White Eye. |
| <i>Esox vittatus</i> | Jack Pike. |
| <i>Esox fasciolaris</i> | Salmon Pike. |
| <i>Catostomus amiopterus</i> | Perch Buffalo. |
| <i>Catostomus ambodon</i> | Black Buffalo. |
| <i>Catostomus velifer</i> | Sailor Fish. |
| <i>Glossodon chrysops</i> | Gold Eye Herring. |
| <i>Clupea chrysochloris</i> | Golden Shad. |
| <i>Silurus pallidus</i> | White Cat Fish. |
| <i>Silurus ceruleus</i> | Blue Cat Fish. |
| <i>Glanis limosus</i> | Mud Cat Fish. |
| <i>Accipenser heptipus</i> | Brown Sturgeon. |
| <i>Dinoctus truncatus</i> | Blunt-nose Sturgeon. |
| <i>Litholepis adamantinus</i> | Diamond Fish or Devil Jack. |

IX. Description of three new Genera of Fluvatile Fish, *Pomoxis*, *Sarchirus*, and *Exoglossum*. <Journal of Philadelphia Academy of Natural Sciences, November, 1818.

- Pomoxis annularis*. 417 = *Pomoxys annularis* Raf.
Sarchirus vittatus 419 = *Lepidosteus ossens* (Lac.) Ag. (juv.)
Exoglossum macrop-
rum 420 = *Hypentelium nigricans* (Le S.) Jor.
Exoglossum annulatum 421 = *Exoglossum maxillingua* (Le S.
Hald.
Exoglossum nigrescens. 422 = *Exoglossum maxillingua*.
Exoglossum lesurianum. 420 = *Exoglossum maxillingua*.

X. Description of a new Genus of Fresh-Water Fish, *Exoglossum*. <Silliman's American Journal of Science and Arts, 1819.

- Exoglossum vittatum* .. 156 = *Exoglossum maxillingua*.
Exoglossum annulatum. 156 = *Exoglossum maxillingua*.

XI. Prodrome de 70 nouveaux Genres d'Animaux découverts dans l'intérieur des États-Unis d'Amérique durant l'année 1818. <Journal de Physique, de Chymie et d'Histoire Naturelle, June, 1819.

- Aplodinotus grunniens*. 419 = *Haploidonotus grunniens* Raf.
Etheostoma flabellaris.. 419 = *Etheostoma flabellaris* Raf. (*Catonotus* Ag.).
Etheostoma caprodes... 419 = *Percina caprodes* (Raf.) Grd.
Etheostoma blennioides. 419 = *Diplesium blennioides* (Raf.) Jor.
Pogostoma leucops 419 = A myth!
Aplocentrus calliops... 420 = A myth!
Calliurus punctulatus.. 420 = *Micropterus salmoides* (Lac.) Gill.
Lepomis cyanellus 420 = *Apomotis cyanellus* (Raf.) Cope &
Jor. (*Bryttus mincopas* Cope).
Lepomis macrochirus .. 420 = *Lepiopomus macrochirus* Raf.
(*nephelus* Cope).
Notemigonus auratus... 421 = *Notemigonus americanus* (Lac.)
Jor.
Amphiodon alveoides.. 421 = *Hyodon tergisus* Le S.
Amblodon bubalus 421 = *Ichthyobus bubalus* (Raf.) Ag. (in
part).
Amblodon niger 421 = *Bubalichthys niger* (Raf.) Ag.

Cycleptus nigrescens... 421=*Cycleptus elongatus* (Le S.) Ag.

Noturus luteus..... 421=*Noturus flavus* Raf.

Pilodietis limosus..... 422=*Pelodichthys olivaris* (Raf.) Gill & Jor.

Litholepis adamantinus. 422=*Litholepis spatula* (Lac.) Jor.

XII. Description of the Silures or Cat-Fishes of the River Ohio, by C. S. Rafinesque, Professor of Botany in the Transylvania University of Lexington, Kentucky. <Quarterly Journal of Science, Literature and Arts, Royal Institution, London, 1820, ix.

Silurus maculatus.. ... 48=*Ichthælurus punctatus* (Raf.) Jor.

var. *erythroptera*..... 49=*Ichthælurus punctatus* (Raf.) Jor.

Silurus pallidus 49=*Ichthælurus punctatus*.

var. *marginatus* 49=*Ichthælurus punctatus*.

var. *lateralis* 49=*Ichthælurus punctatus*.

var. *leucoptera*..... 49=*Ichthælurns punctatus*.

Silurus cerulescens..... 49=*Ichthælurus punctatus*.

var. *melanurus*..... 49=*Ichthælurus punctatus*.

Silurus argentinus..... 50=*Ichthælurns punctatus*.

Silurus nebulosus.. ... 50=*Pelodichthys olivaris* (Raf.) G. & J.

Silurus viscosus..... 50=*Pelodichthys olivaris*.

Silurus lividus..... 51=*Amiurus lividus* (Raf.) Jor.

var. *fuscatus*..... 51=*Amiurus lividus*.

Silurus melas..... 51=*Amiurus melas* (Raf.) Jor. & Cope-land.

Silurus cupreus..... 51=*Amiurus lividus cupreus* (Raf.) Jor.

Silurus xanthocephalus.. 51=*Amiurus xanthocephalus* (Raf.) Gill.

Silurus limosus..... .. 51=*Pelodichthys olivaris*.

III.—ICHTHYOLOGIA OHIENSIS.

Ichthyologia Ohiensis | or | Natural History | of | the Fishes Inhabiting the | River Ohio | and its Tributary Streams | Preceded by a physical description of the Ohio and its branches | by C. S. Rafinesque, | — | Professor of Botany and Natural History in Transylvania University, Author of the Analysis of Nature, &c., &c., member of the Literary and Philosophical Society of New York, the Historical Society of New York, the Lyceum of Natural History of New York, the Academy of Sciences of Philadelphia, the American Antiquarian Society, the Royal Institute of Natural Sciences of Naples, the Italian Society of Arts and Sciences, the Medical Societies of Lexington and Cin-

cinnati, &c., &c. | — | The art of seeing well, or of noticing and distinguishing with accuracy the objects which we perceive is a high faculty of the mind, unfolded in few individuals, and despised by those who can neither acquire it, nor appreciate its results | — | Lexington, Kentucky | printed for the Author by W. G. Hunt (price one dollar). | — | 1820 | (1 vol., 8vo, 90 pp.)

On the reverse of the title-page :

These Pages | and the Discoveries which they contain | in one of the principal Branches | of Natural History, | are respectfully Inscribed | by the Author | To his fellow-labourers in the same field of Science | Prof. Samuel L. Mitchill, M. D. | who has described the Atlantic Fishes of New York, | and to | C. A. Le Sueur, | who was the first to explore the Ichthyology of the Great American Lakes, &c. | In Token | of Friendship, Respect, and Congratulation.

I. Genus, **PERCH**, **PERCA**, *Perche*. (p. 20.)

1st species, **Salmon-Perch**, **PERCA SALMONEA**, *Perche Saumone*. (p. 21.)

STIZOSTETHIUM SALMONEUM Raf., Cope, etc.

A fair description, as Professor Cope has shown. This fish is probably distinct from *S. vitreum*, although the two species are closely related. On page 23, Rafinesque suggests that *P. salmonea* forms a peculiar subgenus or genus which may be called *Stizostedion*. This name antedates *Lucioperca* of Cuvier, and has been generally adopted by recent American authors.

2d species, **Golden-Eyes Perch**, **PERCA CHRYSOPS**, *Perche-œil-d'or*. (p. 22.)

ROCCUS CHRYSOPS (Raf.) Gill.

Description not quite accurate but recognizable. On page 23 the subgeneric name of *Lepibema* is proposed for it, but *Roccus* of Mitchill is older. *Lepibema* may be retained as the name of a subgenus of *Roccus*, the body being shorter and deeper and the dentition somewhat different.

3d species, **Black-dotted Perch**, **PERCA NIGROPUNCTATA**, *Perche a points-noirs*. (p. 23.)

An unrecognizable description, based, as nearly all of Rafinesque's worst descriptions are, "on a drawing" of Mr. Audubon. The original may have been *Percina caprodes*, *Stizostethium canadense*, or nothing. Rafinesque proposes for it the generic name of *Pomacampsis*.

II. Genus, **BUBBLER, AMBLODON**, Amblodon. (p. 24.)

= *Aplodinotus* Rafinesque, 1819.

= *Haploidonotus* Gill, 1861.

4th species, Grunting Bubbler, **AMBLODON GRUNNIENS**, Amblodon grognant. (p. 24.)

HAPLOIDONOTUS GRUNNIENS Raf.

Corvina oscula Cuv. & Val., 1830.

Corvina grisea Dekay, 1842.

Amblodon grunniens Agassiz, 1854.

A very good description.

III. Genus, **PAINTED TAIL, Calliure**. (p. 26.)

Micropterus Lacépède, not *Calliurus* Agassiz, Girard, etc. = *Chænobryttus* Gill.

5th species, Dotted Painted Tail, **CALLIURUS PUNCTULATUS**, Calliure pointille.

MICROPTERUS SALMOIDES (Lacép.) Gill.

The peculiar coloration of the caudal fin which suggested the name *Calliurus*, "base yellow, middle blackish, tip white", belongs among Ohio fishes only to the young of the Black Bass. *Calliurus*, therefore, as shown by Professor Gill, is a synonym of *Micropterus*, and cannot be applied to a distinct genus.

IV. Genus, **SUNFISH, ICTHELIS**, Icthele. (p. 27.)

= **LEPOMIS** Raf., 1819.

1st subgenus, **TELIPOMIS**. (p. 27.)

= **APOMOTIS** Raf., 1819 = *Bryttus* C. & V., 1831.

* 6th species, Gilded Sunfish, **ICTHELIS MACROCHIRA**, Icthele macrochire. (p. 27.)

LEPIOPOMUS MACROCHIRUS Raf.

Lepomis nephelus Cope.

This description applies perfectly to *Lepomis nephelus* Cope, a rather

* Body oval, oblong, gilt, crowded with small brown dots; head small, scaly, opercle flexuose, spot narrow, marginal, and black; jaws equal; tail forked; pectoral fins long and narrow, reaching the anal fin, which has 13 rays, whereof 3 are spiny.

A pretty species from three to four inches long. In the Ohio, Green River, Wabash, &c. Names, Sun-fish, Gold-fish, &c. Head rather acute, not scaly before the eyes. Iris gilt brown. Dorsal fin with 22 long rays, whereof 11 are spiny; a depression between the two sorts of rays. Anal fin broad and rounded. Tail 20 rays. Thoracic 1 and 5. Pectoral 15. Diameter of the body nearly one-fourth of total length (with caudal).

common species in Southern Ohio and Indiana. *Pomotis macrochira* Kirtland is based, in part at least, on *Lepomis pallidus* (Mitch.). *Ichthelis macrochira* Jordan (Man. Vert.) is a *Xenotis*, to which I have since given the name of *X. aurcolus*.

* 7th species, Blue Sunfish, **ICTHELIS CYANELLA**, *Ichthele bleuatre*.

APOMOTIS CYANELLUS Raf.

Bryttus punctatus Cuv. & Val.

Calliurus longulus Girard.

Calliurus formosus Girard.

Calliurus longulus Bliss (*in lit.*—specimens identified).

Chænobryttus mincopas Cope.

Ichthelis melanops Raf. (*Chænobryttus melanops* Cope, not of Gill.)

Rafinesque's description, although erroneous in one or two particulars, refers to a species of *Apomotis*, and the name *cyanella* has priority over all others. As in nearly every case the "diameter" is made too small; evidently Rafinesque trusted his eyes in such cases instead of a tape-line.

† 8th species, Black-Eye Sunfish, **ICTHELIS MELANOPS**, *Ichthele æuil-noir*.

APOMOTIS CYANELLUS Raf.

Description somewhat erroneous, but characteristic.

* Body elliptical, elongate, diameter one-fifth, olivaceous gilt, crowded with irregular blue dots; brownish above; head elongate, lower jaw longer, cheeks with blue flexuose lines; spot oblong, blackish, nearly marginal; tail rounded, notched; anal fin very broad with 12 rays, whereof three are short spiny; pectoral fins very short.

A small species hardly three inches, called Blue-fish or Sun-fish. I found it on the Ohio at the falls. *Appearing entirely blue at a distance.* Head brown above; iris gilt; opercle curved; tail olive-blue with 24 rays. Dorsal fin brownish with 20 rays, whereof 10 are spiny, hardly any middle depression. Pectorals small trapezoidal, 12 rays. Thoracic one and five.

† Body oblong, diameter one-fourth, olivaceous, covered with blue dots, neck brown above, head large, mouth rather large, upper jaw longer; opercule with blue curved and longitudinal lines beneath; spot rounded, black at its base; fins olivaceous, tail bilobed; anal fin with three and nine rays; pectoral fins large oboval.

Length from 2 to 6 inches; common in the tributary streams of the Ohio, the Kentucky, Licking, Miami, &c., and even in small creeks. Vulgar names, Blue-fish, Black-eyes, Sun-fish, Blue-bass, &c. It has black eyes (pupils) like all the other species, but the iris is black also, with a silvery hue or ring. Dorsal fin with 10 and 10 rays, the spiny ones very short. Caudal 20. Pectoral 16. Thoracic 1 and 5 as usual, but the spiny ray is very short, as are also those of the anal fin.

2d subgenus, **POMOTIS**. (p. 28.)

9th species, Red-Eye Sunfish, **ICTHELIS ERYTHROPS**, *Ichthele œuil-rouge*. (p. 29.)

AMPLOPLITES RUPESTRIS (Raf.) Gill.

Bodianus rupestris Rafinesque, 1818.

Description fair. The name *Pomotis*, first proposed in 1819, is a mere synonym of *Lepomis*.

* 10th species, Eared Sunfish, **ICTHELIS AURITA**, *Ichthele oreilleuse*.

XENOTIS LYTHROCHLORIS Jordan. *nom. sp. nov.*

Not *Pomotis auritus* ("L.") Günther.

= *Lepomis auritus* Cope. (Not of Raf. 1818.)

11th species, Big-Ear Sunfish, **ICTHELIS MEGALOTIS**, † *Ichthele megalote*. (p. 29.)

XENOTIS MEGALOTIS (Raf.) Jordan.

Pomotis nitidus Kirtland.

Not *Ichthelis incisor* (C. & V.) Holbr.

Not *Lepomis megalotis* Cope.

Ichthelis megalotis Raf., Bliss (*in lit.*).

Description pretty good. This cannot be the *Lepiopomus pallidus* (*incisor*), as has been supposed by Professor Cope.

V. Genus, RIVER-BASS, LEPOMIS, *Lepome*. (p. 30.)

= *Micropterus* Lacépède.

Not *Lepomis* Raf., 1819.

* Body oval elliptic (diameter one-third), olivaceous with blue and rufous dots; head small, jaws equal, opercle flexuose, appendage black, broad and truncate, some blue flexuose lines on the side of the head; tail brownish lunulate; back brownish; anal fin 3 and 9; pectorals not reaching the vent. Thoracics mucronate.

Length from 3 to 12 inches; common in the rivers, creeks, and ponds of Kentucky. Vulgar name, Sunfish. Iris brown. Dorsal fin brownish, 10 and 10, spiny rays shorter, thoracic fins very long; spiny rays rather shorter, first soft ray mucronate; pectorals nearly rhomboidal with 14 rays, tail 16 rays.

† Body oval, rounded (diameter two-fifths), chestnut color with blue dots, belly red; head large, lower jaw longer, opercle with blue flexuose lines, appendage black, very large elliptic, end rounded; tail black, slightly forked, pectoral large, reaching the vent; anal fin 3 and 9; thoracics long and mucronate; black tail.

A fine species, called Red-belly, Black-ears, Black-tail Sun-fish, &c. It lives in the Kentucky, Licking, and Sandy Rivers, &c. Length from 4 to 8 inches. Head very sloping, iris silvery brown, belly of a bright copper red color. All the fins black except the pectorals, which are olivaceous, trapezoidal, acute and large. The dorsal has 20 rays, whereof 9 short ones are spiny. Body very short, hardly as long as broad, if the head and tail are deducted. Thoracics like those of the foregoing species.

1st subgenus, **APLITES**. (p. 30.)

12th species, Pale River-Bass, **LEPOMIS PALLIDA**, Lepome pale. (p. 30.)

MICROPTERUS PALLIDUS (Raf.) Gill & Jordan.

(Young; "length 6 to 12 inches".)

= *Micropterus nigricans* (C. & V.) Gill.

= *M. floridanus* (Le S.) Goode.

13th species, Streaked-Cheeks, River-Bass, **LEPOMIS TRIFASCIATA**, Lepome trifasceie. (p. 31.)

MICROPTERUS SALMOIDES (Lac.) Gill. ("Over a foot in length".)

14th species, Brown River-Bass, **LEPOMIS FLEXUOLARIS**, Lepome flexueux. (p. 31.)

MICROPTERUS SALMOIDES. (Adult; "reaching the length of 2 feet".)

This is made to form another subgenus, *Nemocampsis*.

2d Subgenus, **DIOPLITES**. (p. 32.)

15th species, Trout River-Bass, **LEPOMIS SALMONEA**, Lepome saumone. (p. 32.)

MICROPTERUS SALMOIDES. ("Length 6 to 24 inches".)

16th species, Spotted River-Bass, **LEPOMIS NOTATA**, Lepome tache. (p. 32.)

MICROPTERUS SALMOIDES. ("3 to 8 inches long".)

17th species, Sunfish River-Bass, **LEPOMIS ICTHELOIDES**, Lepome ictheloide. (p. 32.)

Ambloplites ichtheloides Ag.

AMBLOPLITES RUPESTRIS (Raf.) Gill.

This is made to "almost form a peculiar subgenus", termed *Ambloplites*.

VI. Genus, POMOXIS, POMOXIS, Pomoze. (p. 33.)

= *Pomoxis* Agassiz.

18th species, Gold-Ring Pomozis, **POMOXIS ANNULARIS**, Pomoze annulaire. (p. 33.)

POMOXYS ANNULARIS Raf.

Cichla storeria Kirtland.

Pomoxys storerius, *intermedius*, *protacanthus*, and *brevicauda* Gill.

Description not entirely accurate, but certainly sufficient for identification. This fish is now, as in Rafinesque's time, abundant at the Falls of the Ohio, where it is now called "Bachelor". Throughout Kentucky it is known as the "New Light", and sometimes as "Campbellite". The characters assumed to distinguish *intermedius*, *protacanthus*, etc., are entirely within the bounds of individual variation.

VII. Genus, RED-EYE, *APLOCENTRUS*, Aplocentre. (p. 31.)

19th species, Ohio Red-Eye, *APLOCENTRUS CALLIOPS*, Aplocentre belœuil. (p. 31.)

A myth, described from a drawing by Mr. Audubon. Its characters would indicate a sort of Sunfish with a dorsal fin resembling that of *Coryphæna*, "beginning behind the head with a single long, spiny ray, and ending close to the tail".

The name "Red-Eye" in the region which this fish is supposed to inhabit is chiefly applied to the Rock-Bass (*Ambloplites rupestris*).

VIII. Genus, BARBOT, *POGOSTOMA*, Barbotte. (p. 34.)

20th species, White-Eyes Barbot, *POGOSTOMA LEUCOPS*, Barbotte œuilblanc. (p. 35.)

Another mythical species, "described from a drawing of Mr. Audubon" It is a toothless Sunfish, with two small distant dorsal fins, and six barbels about the mouth. Whatever it is, it has probably no longer "a great many vulgar names, such as White-Eyes, Spectacles-Fish, Streaked Sunfish, Black Sunfish, Barbot, Bearded Sunfish, etc.". Nor do the French settlers call it "Barbotte, Poisson Lunette, and Œuil-Blanc". There is no sort of foundation for Professor Agassiz's assertion that "*Pogostoma* is evidently synonymous with *Lota*".

IX. Genus, HOGFISH, *ETHEOSTOMA*, Etheostome. (p. 35.)

= *Pegedictis* Raf., 1820.

= *Catonotus* Ag., 1854.

= *Etheostoma* Gill. & Jordan emend., 1877.

1st subgenus, *APLESION*. (p. 36.)

= *MICROPTERUS* Lacépède.

21st species, Bass Hogfish, *ETHEOSTOMA CALLIURA*, Etheostome calliure. (p. 36.)

MICROPTERUS SALMOIDES. (Young, 3 to 9 inches long.)

"It has some similarity with the *Lepomis flexuolaris*, and some other River-Bass".—(Raf.)

22nd species, Fantail Hogfish, *ETHEOSTOMA FLABELLATA*, Etheostome eventail. (p. 36.)

ETHEOSTOMA FLABELLARIS Raf.

Etheostoma flabellaris Raf., 1819.

Catonotus flabellatus Auct.

Description fair. The genus *Etheostoma* was based originally on this

species, *E. blennioides*, and *E. caprodes*. The original diagnosis was drawn from *E. flabellaris*, and the subsequent subtraction of the two latter as *Diplesium* leaves the name properly to be retained here.

* 23d species, Black Hogfish, **ETHEOSTOMA NIGRA**, *Etheostome noire*. (p. 37.)

BOLEOSOMA NIGRA (Raf.) Jordan.

Boleosoma maculatum Agassiz.

Boleosoma brevipinne Cope.

Not *Nothonotus maculatus* Agassiz.

Not *Pæciliichthys camurus* Cope.

Description not very good, but I have little hesitation in making the above identification, as the colors of the males of this species in spring are often so intense in life as to give the impression of a truly black fish. The small, dark spots, obvious on close inspection, may be readily overlooked.

The name *Aplesium* cannot be retained for this genus, as in the number of the Western Miscellaneous Mag. in which *Aplesion* was first proposed this species was not included.

I am now convinced that my previous identification of *Etheostoma nigra* with *Pæciliichthys camurus* Cope and *Etheostoma maculatum* Kirt. is erroneous.

† 2d subgenus, **DIPLESION**. (p. 37.)

‡ 24th species, Blunt-Nose Hogfish, **ETHEOSTOMA BLENNOIDES**, *Etheostome blennioide*. (p. 37.)

DIPLESIUM BLENNOIDES Raf.

Etheostoma blennioides Kirtland (description but not figure), (not of Agassiz and late authors).

Pileoma cymatogramma Abbott.

Hystoma cymatogrammum Cope.

Rafinesque's description cannot refer to the "*E. blennioides* Raf." of Agassiz and recent authors (= *Alvordius aspro* Cope and Jor.). The

* Entirely black, pale beneath; scales smooth, lateral line straight, mouth rather beneath, forehead rounded, upper jaw longer; preopercle rounded, spine acute; vent rather anterior; tail entire nearly truncate.

From one to two inches long. Observed in Green River. Vulgar name Black Minny. Iris black, silvery, and small. Diameter one-seventh of the length, without spots. Head small. Pectoral fins oboval. Tail 20. Anal fin 2 and 8. Dorsal 10 and 12.

† Dorsal fin nearly double, divided into two joining parts. Meaning nearly double.

‡ Body elongate, breadth one-eighth of the length, olivaceous, almost diaphanous, some brown spots on the back, and some brown geminate transversal lines across the lateral line,

beautiful and singular coloration of that species—a chain of rounded, confluent, black blotches on a yellowish ground—would surely have been noticed. Moreover, the pattern of color of Rafinesque's fish is exactly that of a young "*Hyostoma cymatogrammum*". Furthermore, the characters "head small", "snout rounded", "mouth small, beneath", "cheeks swelled", "dorsal 13 and 13", "a brown stripe upon it", etc., apply perfectly to the "*Hyostoma*" and not to the "*Etheostoma*". In the streams where Rafinesque collected, I find the former species much the more abundant.

25th species, Common Hogfish, **ETHEOSTOMA CAPRODES**, *Etheostome capros*. (p. 38.)

PERCINA CAPRODES (Raf.) Girard.

Description good.

X. Genus, GOLDSHAD, POMOLOBUS, *Pcmolobe*. (p. 38.)

<*Alosa* of authors.

=*Pomolobus* Gill.

26th species, Ohio Goldshad, **POMOLOBUS CHRYSOCHLORIS**, *Pomolobe dore*. (p. 39.)

POMOLOBUS CHRYSOCHLORIS Raf., Gill., and late authors.

Description good.

XI. Genus, GIZZARD, DOROSOMA, *Dorosoma*. (p. 39.)

=*Chatoëssus* Cuvier and most authors.

=*Dorosoma* Gill.

27th species, Spotted Gizzard, **DOROSOMA NOTATA**, *Dorosoma tache*. (p. 40.)

DORYSOMA HETERURA (Raf.) Jor.

Clupea heterurus Raf., 1818.

Chatoëssus ellipticus Kirtland.

Good description of a young specimen.

which is straight, but raised at the base. *Head small, snout rounded, mouth small beneath, lower jaw shorter*; opercle angular, spine acute; scales ciliated, pectoral fins elongate, tail also, and bilobed at the end.

A strange species, which has the appearance, head and spots of many Blennies. Length 2 or 3 inches, and slender. Seen in the Ohio, Wabash, Muskingum, &c. Color *pale, sometimes fulvous, whitish beneath. Cheeks swelled and smooth, preopercle simple arched, opercle quite angular*; iris large and blackish; scales roughened by the ciliation. *Dorsal fin 13 and 13, beginning above the middle of the pectorals and ending with the anal, one faint, longitudinal brown stripe on it. Tail 20 rays, with many small transverse lines. Vent medial. Anal fin 2 and 8. Pectoral fins 16, oblong acute.*

* **XII. Genus, GOLD HERRING, NOTEMIGONUS**, Notemigone. (p. 40.)

< *Abramis* Cuvier and many authors (not type).

= *Stilbe* Dekay (pre-occupied in botany).

= *Stilbius* Gill.

= *Luxilus* Girard (not of Rafinesque = *Hypsilepis*).

= *Leucosomus* Storer (not of Heckel).

= *Plargyrus* Putnam (not of Rafinesque, etc.).

† 23th species, **Ohio Gold Herring, NOTEMIGONUS AURATUS**, Notemigone dore. (p. 40.)

NOTEMIGONUS AMERICANUS (L.) Jordan.

Cyprinus americanus Linnæus.

Stilbe chrysoleuca (Mit.) Dek.

Stilbe americana (L.) Cope.

Abramis americanus (L.) Günther.

A very good description, correct in every particular. This fish is rarely or never called Shiner in the Ohio Basin, and it is very often considered by the fisherman as a Shad. If this genus be really distinct from the European *Abramis*, as its serrated teeth indicate, the generic name of *Notemigonus* must be adopted.

XIII. Genus, FALSE HERRING, HYODON, Hyodon. (p. 41.)

1st subgenus, **AMPHIODON**. (p. 41.)

29th species, **Toothed False Herring, HYODON AMPHIODON**, Do. (sic.) (p. 42.)

HYODON TERGISUS Le Sueur.

It is now generally conceded that there is but one species of *Hyodon*. I find some variation in form of body and number of fin-rays in specimens from different waters, but nothing indicating specific distinction. No author, so far as I know, has paid any attention to the numerous

* Body fusiform, compressed, scaly. Vent posterior. Abdomen *obtusely carinated, not serrate*; back similar before the dorsal fin. Head scaleless, mouth small, without teeth, lower jaw longer; gill-cover double, opercle simple. Abdominal fins with nine rays and no lateral appendage. Dorsal fin behind them above the vent. This genus differs from *Clupea* by the carinated back and belly, without serratures, and the posterior dorsal. The name means back half angular. 14th G. of my Prodr. N. G. Animals.

† Back gilt olivaceous, remainder gilt silvery; fins yellow; lateral line following the curve of the belly; dorsal with 9 rays, anal with 12; tail equally forked.

Length from 4 to 8 inches, diameter one-fifth of the total length. Iris gilt. Tongue short, toothless. Scales large, radiating with nerves. Head convex above and small. Dorsal fin broad trapezoidal, the first ray longer. Anal broad also, but not so much. Pectoral small with 16 rays. Tail 24. Not uncommon in the Ohio, Kentucky, Miami, &c. The vulgar names are Gold Herring and Yellow Herring. It appears in the fall. It does not bite at the hook. Flesh pretty good.

species of Rafinesque. The name *Glossodon* was published by Rafinesque for this genus in September, 1818, within a few days of the publication of *Iliodon* by Le Sueur. It is not known which has priority, but as Le Sueur's paper was first written, and as his name has come into common use, it is probably best to retain it.

30th species, Summer False Herring, **HYODON HETERURUS**, Hyodon heterure. (p. 42.)

2d subgenus, **GLOSSODON**. (p. 42.)

31st species, Summer False Herring, **HYODON VERNALIS**, Hyodon printanier. (p. 43.)

3d subgenus, **CLODALUS**. (p. 43.)

32d species, May False Herring, **HYODON CLODALUS**, Hyodon de May. (p. 43.)

33d species, Lake False Herring, **HYODON TERGISUS**, Hyodon lacustre. (p. 43.)

XIV. Genus, TROUT SALMO, Truite. (p. 44.)

34th species, Alleghany Trout, **SALMO ALLEGANIENSIS**, Truite alle-ganienne. (p. 44.)

SALMO FONTINALIS Mitchill.

35th species, Black Trout, **SALMO NIGRESCENS**, Truite noiratre. (p. 45.)
SALMO FONTINALIS Mitchill.

* **XV. Genus, MINNY, MINNILUS**, Minny. (p. 45.)

* Body elongated, somewhat compressed, covered with small scales. Vent medial Head flat above, and somewhat shielded. Gill-cover double, scaleless, three branchial rays. Mouth diagonal, small, toothless and beardless, without lips, lower jaw shorter and narrower. A small trapezoidal dorsal fin, nearer to the head than to the tail, opposite to the abdominal fins, and without spines. Abdominal fins with eight rays, and without appendages. (Tail forked in all the Ohio species.)

There are in the United States more than fifty species of small fresh-water fishes (and in the Ohio waters more than sixteen species), commonly called Minnies, Minnows, Bait-fish, Chubs, and Shiners, which should belong to the genus *Cyprinus* of Lin-næus, or, rather, to the part of it which has been called *Leuciscus* by Klein and Cuvier; which subgenus (or genus) is distinguished by a small dorsal fin, no spines nor beards; but as the genus *Cyprinus* forms now a large family, and even the genus *Leuciscus* must be divided, since it contains more than one hundred anomalous species, differing in the position of the dorsal fin and the vent, the number of rays to the abdominal fins, &c., I venture to propose this and the three following genera. Three other different genera might be established upon the European species, distinguished as follows:

Dobula. Dorsal fin nearer to the tail, abdominal fins with nine rays and an appendage; upper jaw longer.

Phoxinus differs by ten abdominal rays and no appendage.

Alburnus differs from *Dobula* by no appendage and the lower jaw longer.

Besides my genus *Hemiplus* (Annals of Nature), which has the vent posterior, the lower jaw longer, only five rays and an appendage to the abdominal fins.

All these small fish are permanent; they feed on worms, insects, univalve shells, and spawn; they bite at a small hook, baited with worms or flies, and they form an excellent bait for all the larger fish which feed upon them. They are good to eat when fried.

* 36th species, Slender Minny, *MINNILUS DINEMUS*, Minny emeraude. (p. 46.)

NOTOTROPIS DINEMUS (Raf.) Jordan.

Alburnellus jaculus Cope.

The coloration and form are those of *Alburnellus jaculus*, with which I have identified this description.

† 37th species, Spotted Minny, *MINNILUS NOTATUS*, Minny tache. (p. 47.)

HYBORHYNCHUS NOTATUS (Raf.) Ag.

Hyborhynchus notatus Agassiz.

Hyborhynchus superciliosus Cope.

Agassiz's identification of his *Hyborhynchus* with this species is possibly correct, although the description is very irrelevant. The common *Hyborhynchus* of the Ohio region has small but distinct barbels at the angle of the mouth, and is therefore *H. superciliosus* of Cope. The latter name is probably a synonym of *H. notatus*.

‡ 38th species, Little-Mouthed Minny, *MINNILUS MICROSTOMUS*, Minny microstome. (p. 47.)

HYBOPSIS MICROSTOMUS (Raf.) Jordan.

Hybopsis longiceps Cope.

Hybopsis microstomus (Raf.) Jordan.

This description agrees very closely with specimens sent me by W. M.

* Diameter one-eighth of total length, silvery, back olivaceous with a brown longitudinal stripe in the middle; two lateral lines, one straight, the lower curved downwards and shorter; head gilt and green above. Dorsal fin 9 rays. Anal fin 12 rays.

A small and slender species, common in the Ohio, &c., and going in flocks; length 2 or 3 inches. Its head is beautiful when alive; it is above of a fine gold color with green shades, becoming of an emerald-green above the eyes. Iris silvery; sides opaque, upper lateral line gold-green. Nostrils large. Pectoral fins with 12 rays, not reaching the abdominal. All the fins silvery. Tail with 24 rays. Scales very small.

† Diameter one-seventh of total length, silvery, back olivaceous with a large brown stripe in the middle; head brown above, lateral line straight, a black spot at the base of the tail. Dorsal with 8, and anal with 9 rays.

Same size with the preceding, but not so slender, and less common. Iris golden, nostrils very large, mouth small, lateral line shining blue on the opaque sides. Pectoral fins with 12 rays, and not reaching the abdomen. Tail with 14 rays. It is often called Minny Chub.

‡ Diameter one-seventh of total length; silvery, olivaceous on the back and head, sides with a few black dots, lateral line straight, pectoral fins reaching the abdominal fins. Dorsal and anal fins with eight rays.

A small species found in the Kentucky River. Mouth very small, nostrils large, iris silvery, fins fulvous, the pectoral with 12 and the caudal with 24 rays. Head elongated.

Linney from Salt River, Kentucky. An examination of Professor Cope's types of *Hybopsis longiceps* has convinced me of the identity of that species with Rafinesque's. It is perhaps best to unite *Hybopsis* with *Luxilus*. The distinctive character of the high scales, so noticeable in *L. cornutus*, fades by insensible degrees into the ordinary *Hybopsis* type.

Under *Luxilus* the following subgeneric sections are probably conveniently recognizable:

- a. *Luxilus*: type *cornutus*.
- b. *Alburnops*: type *blennius*.
- c. *Hybopsis*: type *gracilis*.
- d. *Hudsonius*: type *hudsonius*.

* XVI. Genus, **SHINER**, *Luxilus*, *Luxile*. (p. 47.)

Hypsilepis Baird, 1854.

Hybopsis Ag., 1854.

Alburnops and *Hudsonius* Grd., 1856.

Luxilus Jordan, 1876.

1st subgenus, **CHROSOMUS**. (p. 47.)

39th species, Red-Belly Shiner, **LUXILUS ERYTHROGASTER**, *Luxile erythrogastre*. (p. 47.)

CHROSOMUS ERYTHROGASTER Raf.

Description characteristic, although slightly erroneous. The coloration described is that of *C. oreas* Cope, rather than that of the *erythrogaster* of Agassiz.

† 2d subgenus, **LUXILUS**. (p. 48.)

= *Plargyrus* Girard (*nee* Rafinesque).

= *Hypsilepis* Baird and most authors.

= *Luxilus* m.

* Difference from *Minnilus*: Vent posterior or nearer to the tail. Mouth rather large, commonly with lips and equal jaws. Scales rather large. Preopercle with an angular suture.

† Mouth rather large, with small flat lips, jaws equal, scales large.

* 40th species, Gold-Head Shiner, **LUXILUS CHRYSOCEPHALUS**, *Luxile chrysocephale*. (p. 48.)

† **LUXILUS CORNUTUS** (Mitch.) Jor.

Cyprinus cornutus Mitchill.

Hypsilepis cornutus (Mitch.) Storer and authors.

Plargyrus typicus, cornutus, frontalis, etc., Girard.

Description fair, excepting that the pectorals scarcely reach the ventrals, and older specimens are less elongated. The *cornutus* is very abundant throughout the Ohio Valley, where it is everywhere known as the *Shiner*, a name rarely applied to any other fish. Rafinesque's description is very correct as regards its average appearance in the West when not tuberculate or flushed with red. His account has, however, been carelessly referred to *Cyprinus chrysoleucus* of Mitchill, solely on account of the similarity of the names, although Rafinesque correctly indicates the chief points of difference. As *chrysocephalus* is evidently intended as the type of *Luxilus*, the latter is synonymous with *Hypsilepis*, and we have no alternative but to restore the older name in place of the latter and more scientific appellation.

‡ 41st species, Kentuckian Shiner, **LUXILUS KENTUCKIENSIS**, *Luxile du Kentucky*. (p. 48.)

? ? **LUXILUS CORNUTUS** (Mit.) Jor.

Not *Luxilus kentuckiensis* Kirtland.

This species is not yet satisfactorily identified. It is certainly not

* Diameter one-fifth of total length, *silvery* with golden shades on the sides, *head gilt*, *back and nape dark olivaceous*; *lateral line curved downwards*, pectoral fins reaching the abdominal. *Dorsal and anal fins with nine rays*.

Vulgar names: Gold Chub, *Shiner*, Goldhead, &c. Length 6 inches. It is found in Kentucky, Ohio, Cumberland, Green River, &c. *Iris golden*. *Fins fulvous*, the pectoral golden, large, with 14 rays; tail with 24. *It resembles the common Shiner or Butterfish of Pennsylvania, Cyprinus chrysoleucos* Mitchill, but that fish is a *Rutilus*, having nine abdominal rays; its body is besides shorter and the anal fin is *falcatid* with 15 rays.

† Additional evidence of the correctness of this identification is found in a MSS. paper on the Fishes of Pennsylvania, by Rafinesque, now in the possession of Professor Baird. In this paper the species in question is described under the name of *Luxilus cornutus* (Mit.) Raf.

‡ Diameter one-seventh of total length, *silvery*, back *olivaceous*, lateral line curved downwards, *dorsal and caudal fins red*, the pectoral yellow, not reaching the abdomen. *Dorsal 8 and anal 7 rays*.

Vulgar names: Indian Chub, Red-tail, Shiner, &c. Length about 4 inches. It is reckoned an excellent bait for anglers, because it will swim a long while with the hook in its body. Eyes small, iris brown with a gold ring. Yellowish-brown above the head. Abdominal and anal fins white. Pectoral and abdominal fins oboval, with 12 rays. Tail with 24 rays.

the Silver-Fin, *Luxilus kentuckiensis* Kirtland, as has been shown by Professor Cope.

* 42d species, Yellow Shiner, **LUXILUS INTERRUPTUS**, *Luxile jaunatre*. (p. 49.)

Not identified.

The description contains little that is suggestive, and it might apply to almost any of the small silvery species.

XVII. Genus, CHUBBY, SEMOTILUS, Semotile. (p. 49.)

= *Semotilus* Raf.

43d species, Bigback Chubby, **SEMOTILUS DORSALIS**, *Semotile dorsal* (p. 49.)

SEMOTILUS CORPORALIS (Mitchill) Putnam.

44th species, Bighead Chubby, **SEMOTILUS CEPHALUS**, *Semotile cephalo*. (p. 49.)

SEMOTILUS CORPORALIS (Mitchill) Putnam.

†45th species, Warty Chubby, **SEMOTILUS DIPLEMIUS**, *Semotile ver-ruequeux*. (p. 50.)

LYTHRURUS DIPLEMIUS (Raf.) Jor.

Not *Leuciscus diplemius* Kirtland (= ? *Lux. cornutus* var.).

Hypsilepis diplamia Cope.

This can hardly be the *Lythrurus diplemius*, as that species has a long anal fin, and the male fish has, instead of "some black warts on the head", the whole upper surface of the head and neck studded with minute whitish tubercles. Moreover, the dorsal spot is not "round", and there is no caudal spot. Still, as I can at present suggest no better identification, I allow that made by Professor Cope to stand.

* Diameter one-sixth of total length; yellowish-olivaceous above, silvery beneath, rufous brown above the head, a rufous line from the dorsal to the tail, two straight and separated half lateral lines, the anterior one above the posterior; pectoral fins reaching the abdominal. Dorsal with 10 and anal with 9 rays.

A small species, only 3 inches long, called Yellow Chub or Shiner. Seen in the Ohio. Sides opaque, with violet shades. Iris silvery, mouth large, lips very apparent. Fins yellowish, pectorals with 16 rays, caudals with 24.

† Diameter one-sixth of total length; olivaceous brown with gold shades above, silvery beneath; lateral line double, the anterior and lower curved upwards at the base, reaching to the abdominal fins, the posterior and upper straight from the pectoral fins to the tail; fins red, a spot at the base of the dorsal and caudal, and many dots over them. Dorsals with nine rays; the anal with eight.

Length from 3 to 4 inches, often called Minny or Red-Fin. Observed in the Kentucky River near Estill. The male fish has a larger mouth than the female and some black warts on the head. Fulvous brown on the head. Iris large, golden and white. Some black dots on the dorsal and caudal fins; the caudal spot is on tail and the dorsal at the anterior base; they are small and round. The pectoral fins do not reach the abdominal fins; they have 18 rays; the tail has 24.

* XVIII. Genus, FALLFISH, *Rutilus*, *Rutile*. (p. 50)

= *LEUCISCUS* Klein.

† 46th species, Silverside Fallfish, *RUTILUS PLARGYRUS*, *Rutile plargyre*. (p. 50.)

LUXILUS CORNUTUS (probably).

Rafinesque's account applies about equally well to *Luxilus cornutus* and *Cyprinella analostana* Grd. I prefer to follow Dr. Kirtland and writers generally in identifying it with the preceding species. The name *Plargyrus* is not available for any of our genera of *Cyprinidae*. As *Cyprinus rutilus* L. is stated to be the type of *Rutilus* Raf., it is the type of that genus, and the provisional name *Plargyrus* is unnecessary.

‡ 47th species, Baiting Fallfish, *RUTILUS COMPRESSUS*, *Rutile appat*. (p. 51.)

Not yet satisfactorily identified. It is probably not *Leuciscus compressus* of Kirtland. It may have been based in part on *Nototropis rubrifrons* (Cope.)

§ 48th species, Round-Nose Fallfish, *RUTILUS AMBLOPS*, *Rutile amblopse* (p. 51.)

NOCOMIS AMBLOPS (Raf.) Cope & Jordan.

Ceraticthys hyalinus Jordan, Man. Vert. (not of Cope).

Description rather indefinite. As Girard has identified it with a species of *Ceraticthys*, I refer it to a member of that genus common at the

* Difference from *Minnilus*: Vent posterior, nearer to the tail. Abdominal fins with nine rays. Mouth large and with lips. Scales large.

I call this genus *Rutilus*, in the supposition that the *Cyprinus rutilus* may be the type of it; if it should be otherwise, it may be called *Plargyrus*.

† Diameter one-fifth of total length; silvery, back with the dorsal, pectoral, and caudal fins olivaceous; lateral line curved downwards; snout truncate; mouth almost vertical. Dorsal and anal fins with 9 rays.

Length from 4 to 6 inches; vulgar names:—Silverside, Shiner, White Chub, &c. Common in the streams of Kentucky. Mouth large, upper jaw almost vertical, yet longer than the lower. Iris white. Pectoral fins with 14 rays, reaching almost the abdominals, which are oboval and white. Tail forked as usual with 24 rays. Scales large.

‡ Diameter one-seventh of total length; silvery, back fulvous, sides compressed, lateral line straight, raised upwards at the base, snout rounded, mouth hardly diagonal, nearly horizontal. Dorsal and anal fins with 9 rays.

A small fish from 2 to 4 inches long, called Fall-fish, Bait-fish, Minny, &c. It is found in the Alleghany Mountains, in the waters of the Monongahela, Kenhaway, and even in the Potomac. The name of Fall-fish arises from its being often found near falls and ripples. Body more compressed than in the other species; as much so as in the genus *Minnilus*. Scales large; lips a little fleshy; iris silvery-gilt; fins transparent; the pectoral with 14 rays, and not reaching the abdominal; tail with 32 rays.

§ Diameter one-sixth of total length; silvery, head fulvous above, snout round;

Falls of the Ohio, which, if distinct from *C. hyalinus* Cope, as Professor Cope thinks, seems not to have received any other name.

49th species, Black-tail Fallfish, **RUTILUS MELANURUS**, Rutilé melanure. (p. 51.)

MYXOSTOMA DUQUESNII (Le S.) Jor. (young).

Description incorrect and insufficient. The "15 dorsal rays" indicates a Sucker, and the coloration is that of a young "Red-Horse".

* 50th species, Anomal Fallfish, **RUTILUS ANOMALUS**, Rutilé anomal. (p. 52.)

? **CAMPOSTOMA ANOMALUM** (Raf.) Ag.

This description is perhaps intended for *Campostoma*, but it is very imperfect, if not erroneous.

† 51st species, Red Minny, **RUTILUS ? RUBER**, Rutilé rouge. (p. 52.)

LYTHRURUS species.

Probably the male fish of one of the species of *Lythrurus* is intended rather than a *Chrosomus*, as supposed by Professor Agassiz. *Lythrurus ardens* is abundant in the upper waters of the Cumberland. Few fishes in our waters are of so "fine a purple red".

XIX. Genus, FAT-HEAD, PIMEPHALES, Pimephale. (p. 52.)

52d species, Blackheaded Fat-head, **PIMEPHALES PROMELAS**, Pimephale tête-noire. (p. 53.)

PIMEPHALES PROMELAS Raf.

Description fair. This species is very abundant in small streams about the Falls of the Ohio.

sides with an opaque band, lateral line straight; pectoral fins with 12 rays, and reaching the abdominal fins. Dorsal and anal fins with 10 rays.

Length 1 or 2 inches. Vulgar name: White Chub, or Fall-fish. It is found at the falls of the Ohio. Back slightly fulvous, snout large and rounded, mouth hardly diagonal, eyes large, iris silvery, and scales large. Tail with 30 rays.

* Diameter one-fifth of total length, fulvous above, sides dusky, white beneath, snout rounded, a vertical brown line behind the gills; lateral line straight, raised upwards at the base; pectoral fins yellow, oboval, short, with 15 rays; tail unequally bilobed, the upper lobe larger. Dorsal and anal fins red; dorsal 8 and anal 7 rays.

An anomalous fish, differing from all those of the Cyprinian tribe in the Ohio, by its unequal bilobed tail, which is brownish, and has 22 rays. Mouth diagonal. Eyes small; iris olivaceous gilt. Nape of the neck red, scales rather small. Length 3 inches. Found in Licking River, &c. Vulgar names: Chub, Redfish, Fallfish, &c.

† Entirely red; tail forked.

I add here a fine small fish, which I have never seen as yet, but it is said to live in the small streams which fall into the Elkhorn and Kentucky. It is a slender fish, only 2 inches long, compressed, and of a fine purple red. It may belong to this genus, or to any other of this tribe. It is commonly called Red-minny.

XX. Genus, SUCKER, CATOSTOMUS, Catostome. (p. 53.)

* 1st subgenus, MOXOSTOMA. (p. 54.)

Myxostoma Jor.(Not *Moxostoma* of Agassiz and authors = *Erimyzon m.*)

† 53d species, Ohio Carp-Sucker, CATOSTOMUS ANISURUS, Catostome anisure. (p. 54.)

MYXOSTOMA ANISURA (Raf.) Jordan.

(Not *Moxostoma anisurus* Agassiz = *Erimyzon oblongus* (Mit.) Jordan.)*Catostomus anisurus* Kirtland.*Ptychostomus collapsus* Cope.

This species, described by Rafinesque, and described and figured by Dr. Kirtland, is said to possess a lateral line, and to have red fins. Furthermore, it is known as "Carp", and reaches a length of 1 to 3 feet. It is evidently not a *Moxostoma* as that genus is defined by Agassiz, but a *Ptychostomus*. *Moxostoma* becomes, therefore, a synonym of *Ptychostomus*, and having priority must supersede it. In accordance with the etymology of the word, I have changed the first vowel *o* to *y*.

54th species, Buffalo Carp-Sucker, CATOSTOMUS ANISOPTERUS, Catostome anisopture. (p. 54.)

? *Carpiodes velifer* (Raf.) Ag.

An insufficient description of some *Carpiodes* "from a drawing by Mr. Audubon". Rafinesque remarks: "The *C. tuberculatus* of Le Sueur belongs also to this subgenus, having 8 abdominal rays, but its tail is regularly bifid".

2d subgenus, ICTIOBUS. (p. 55.)

= *Ichthyobus* Agassiz."The *C. gibbosus* and *C. communis* of Le Sueur appear to be intermedi-

* Body oblong, compressed; head compressed, eight abdominal rays, dorsal fin commonly longitudinal; tail commonly unequally forked.

† Diameter one-fifth of the length; silvery, slightly fulrescent above, fins red, the dorsal olivaceous, falcated with 17 rays, nearer to the head and reaching the vent; lateral line curved upwards and flexuose at the base; snout gibbose; tail forked, upper part longer. Anal fin falcate with 8 rays.

A large species common all over the Ohio and the largest streams, as far as Pittsburgh. Permanent and sometimes taken in winter. It is called Carp everywhere. Length from one to three feet. It is taken with the hook, seine and dart. Its flesh is pretty good, but soft. The male fish has a red tail; while it is olivaceous in the female. Snout divided from the head by a transverse hollow which makes it gibbose. Eyes black, iris silvery and golden above. Sides often with copper shades. Scales large with concentric stria. Pectoral fins large, oval acute, with 15 rays, and reaching the abdominal fins. Caudal with 24 rays.

ate between this subgenus and the foregoing, having 9 abdominal rays, but an unequally bilobed tail.”—(Raf.)

55th species, Brown Buffalo-Fish, **CATOSTOMUS BUBALUS**, Catostome bubale. (p. 55.)

ICHTHYOBUS BUBALUS (Raf.) Ag.

Description passable.

* 56th species, Black Buffalo-Fish, **CATOSTOMUS NIGER**, Catostome noir. (p. 56.)

? BUBALICHTHYS NIGER (Raf.) Ag.

Description insufficient.

3d subgenus, **CARPIODES**. (p. 56.)

Carpiodes Agassiz and authors.

“The *C. cyprinus* and *C. setosus* of Le Sueur belong to this subgenus.”—(Raf.)

† 57th species, Olive Carp-Sucker, **CATOSTOMUS CARPIO**, Catostome carpe. (p. 56.)

CARPIODES CARPIO Raf.

Carpiodes nummifer Cope.

This description apparently refers to the species lately called *C. nummifer* by Professor Cope. I therefore adopt Rafinesque’s specific name.

58th species, Sailing-Sucker, **CATOSTOMUS VELIFER**, Catostome volant. (p. 56.)

CARPIODES VELIFER (Raf.) Ag.

A fair description.

‡ 59th species, Mud-Sucker, **CATOSTOMUS XANTHOPUS**, Catostome xanthope. (p. 57.)

HYPENTELIUM NIGRICANS (Le S.) Jor.

It is possible that this description was intended for the *Cat. nigricans* Le S., but the latter is certainly not a “mud-fish”, as Professor Agassiz

* Entirely black, lateral line straight.

I have not seen this fish. Mr. Audubon describes it as a peculiar species, found in the Mississippi and the lower part of the Ohio, being entirely similar to the common Buffalo-fish, but larger, weighing sometimes upwards of 50 pounds, and living in separate shoals.

† Diameter one-fourth of the length; olivaceous above, pale beneath, chin white, abdomen bluish; lateral line straight, dorsal fin somewhat falcated with 36 rays, and trapezoidal with 10 rays; head sloping, snout rounded.

Seen at the falls of the Ohio; commonly called Carp. Length from one to two feet. Eyes very small and black; fins olivaceous brown, the pectorals olivaceous, trapezoidal, short, and with 16 rays. Tail with 24. Dorsal fin beginning before the abdominal and reaching the end of the anal fin. Not so good to eat as the Buffalo-fish.

‡ Diameter one-fourth of the length; lateral line straight; silvery, back olivaceous,

seemed to suppose. Of all the Suckers, it is the most readily affected by impure water, and it is usually to be found only in clear, running streams.

* 4th subgenus **TERETULUS**. (p. 57.)

Of the species assigned to this subgenus, three belong apparently to *Myxostoma*, three to *Catostomus* proper, two to *Hymentelium*, five to *Erimyzon*, one is a *Cyprinoid*, and the last a myth.

As the name *Teretulus* has been restricted to the genus typified by *Catostomus aurcolus* Le S., it is best to consider it as a synonym of *Myxostoma*.

† 60th species, Black-face Sucker, **CATOSTOMUS MELANOPS**, *Catostome melanopse*. (p. 57.)

ERIMYZON SUCETTA (Lac.) Jor.

? *Cyprinus sucetta* Lac.

Catostomus melanops Kirtland.

Ptychostomus melanops Agassiz and authors.

Erimyzon melanops (Raf.) Jordan.

Description poor but unmistakable. This fish has the air-bladder in two parts, and the lateral line is obsolete, as stated by Kirtland. It is

head brown above, snout gibbose rounded; dorsal fin hardly falcate with 14 rays, anal aneoclate with 8 rays; lower fins yellowish.

Found below the falls. Length from 6 to 10 inches. It lives in muddy banks and conceals itself in the mud. Flesh very soft. Head large, flattened above, mouth large, eyes large. Iris silvery. Lateral line hardly raised at the base. Dorsal fin above the abdominal, fins olivaceous as well as the tail, which has 20 rays. Pectorals with 18 rays. Scales large.

* Body elongate cylindrical or somewhat quadrangular, 9 abdominal rays, dorsal fins commonly small, tail equally forked.

An extensive subgenus, to which belong all the following species of Le Sueur: *C. aureolus*, *C. macrolepidotus*, *C. longirostrum*, *C. nigricans*, *C. vittatus*, *C. maculosus*, *C. sucetta*, besides the *C. teres* and *C. oblongus* of Mitchill.

† Diameter one-seventh of the length; head squared, blackish above, snout convex obtuse; *back olivaceous, sides whitish with scattered black dots*, a black spot on the gill cover, and a large one between the dorsal and caudal fins; lateral line straight, dorsal fin with 14 rays, anal with 9 rays.

A singular species seen at the falls. It is rare, and called *Spotted Sucker* or *Black Sucker*. Length from 4 to 6 inches; body cylindrical, flattened beneath as far as the vent. Head flat above, blackish there and in the fore part. Mouth almost terminal with thick whitish lips, the lower one shorter and thicker, a few small black spots on the sides of the head, and a large one on the preopercle. Gill cover silvery. Eyes black, iris brown with a gold ring. Back of a rufescent color with gold shades. A very large black patch above the anal fin before the tail. *Sides pale with small unequal black dots*, belly whitish. *Fins coppery*, the pectoral elliptical elongated with 18 rays, the anal elongated reaching the tail, the dorsal broad and opposed to the abdominal. Tail with 20 rays. *Scales rather large* nervose radiated.

therefore an *Erimyzon* and not a "*Ptychostomus*". Both *E. oblongus* and *E. melanops* abound in the lakes as well as in the Ohio. They are much more tenacious of life than the other Suckers. The description of *Cyprinus sucetta* Lacépède (*Catostomus suceti* C. & V.) seems to refer to this species. I therefore have adopted the prior name *sucetta* in preference to that of *melanops*.

The "lateral line" alluded to by Rafinesque here, as in numerous other instances, is merely a lateral streak along the rows of scales, either due to longitudinal furrows or else to peculiarities of coloration.

* 61st species, Black-back Sucker, **CATOSTOMUS MELANOTUS**, *Catostome melanote*. (p. 58.)

? **CAMPOSTOMA ANOMALUM** (Raf.) Ag.

The "nine dorsal rays" indicates a *Cyprinoid*, and the only species found at the Falls of the Ohio which at all answers this description are the *Nocomis biguttatus* and *Campostoma anomalum*. It is best to identify it with the latter, and thus to avoid a change of names.

† 62d species, Rough-head Sucker, **CATOSTOMUS FACIOLARIS**, *Catostome fascie*. (p. 58.)

ERIMYZON OBLONGUS (Mitch.) Jor.

Moxostoma oblongum (Mitch.) Ag.

Description indifferent, "from a drawing by Mr. Audubon". The tuberculated snout indicates a spring male of *oblongus*, rather than *nigricans*, to which Professor Agassiz refers Rafinesque's description.

* Diameter one-sixth of the length; bluish black above, whitish beneath; head convex, snout obtuse; lateral line straight; dorsal and anal fins with nine rays.

Seen only once at the falls. Length 6 inches, body nearly cylindrical. Mouth rather inferior, lips thick and somewhat gristly. Iris silvery. Scales pretty large. Fins whitish, the dorsal and caudal a little reddish. Pectoral fins elliptical with 16 rays. Tail 20. Dorsal fin trapezoidal, opposed to the abdominal, the first ray shorter. Anal elliptical obtuse. Vulgar names, Black Sucker and Blue Sucker.

† Diameter one-sixth of the length; brown above, white beneath, sides with small transversal black lines; head sloping, tuberculated above, snout obtuse; dorsal fin longitudinal reaching the end of the anal fin, lateral line straight.

I have not seen this species, but describe it from a drawing of Mr. Audubon. It is found in the lower part of the Ohio. Vulgar names: Rough-head Sucker, Pike-Sucker, Striped Sucker. Length about eight inches, body cylindrical tapering behind. Eyes small, mouth beneath. Lower fin trapezoidal, about twenty transversal lines. A doubtful species, perhaps an *Hydrargyrus*, but the mouth is like that of the Sucker.

* 63d species, Red-tail Sucker, *CATOSTOMUS ERYTHRURUS*, *Catostome rougequeue*. (p. 59.)

MYXOSTOMA DUQUESNEI (Le S.) Jor.

? *Catostomus duquesnei* Le Sueur.

Ptychostomus erythrurus (Raf.) Cope.

Ptychostomus duquesnei (Le S.) Ag.

Description not very good. The common "Red-Horse" of the Ohio is certainly Le Sueur's *duquesnei*. Professor Cope recognizes Rafinesque's species as distinct, but I have not yet been able to separate it.

† 64th species, Kentucky Sucker, *CATOSTOMUS FLEXUOSUS*, *Catostome flexueux*. (p. 59.)

CATOSTOMUS TERES (Mitch.) Le S.

Description fair. Professor Agassiz is certainly wrong in referring this species to the *Cat. nigricans* of Le Sueur. The description accords better with *Cat. teres*, and the statements with regard to the habits and common name point very strongly to this species, which is still known everywhere in Kentucky as the "Sucker".

‡ 65th species, Big-mouth Sucker, *CATOSTOMUS ? MEGASTOMUS* *Catostome megastome*. (p. 59.)

A myth.

* Diameter one-fifth of the length: rufous brown above, white beneath: tail oblique: head convex, snout rounded: lateral line straight: dorsal fin trapezoidal, reddish with 12 rays: anal fin elongated, yellow, anal falcated, with 7 rays.

A fine species, not uncommon in the Ohio, Kentucky, Cumberland, Tennessee, &c. Vulgar names: Red-horse, Red-tail, Horse-fish, Horse-Suckers, &c. Length about one foot. Scales very large. Mouth beneath. Iris whitish, eyes black. Pectoral fins yellow, elliptical, reaching the abdominals, and with 16 rays. Tail large with 20 rays. Its flesh is dry and not very good to eat.

† Diameter one-fifth of the length; silvery, back brownish, scales rather rough. opercle flexuose; head squared, snout gibbose truncate; lips very thick, the inferior bilobed; lateral line flexuose; tail brown; dorsal fin blackish with 12 rays, anal fin whitish with 7 rays and reaching the tail.

The most common species, in Kentucky, in all the streams and ponds, called merely Sucker. Very good to eat. It conceals itself in the mud in winter. It bites at the hook, living on minnies and little lobsters. Body thick cylindrical. From 10 to 12 inches long. Head large, a deep depression between the snout and the head, mouth large with fleshy lips. Eyes large, black, iris yellow. Opercle hard bony. Lower fins whitish, pectorals elongated elliptical with 20 rays. Tail 20 rays. Dorsal trapezoidal, sloping behind. This fish is the most useful to keep in ponds.

‡ Diameter one-fifth of the length; blackish above, yellowish beneath, very broad; a spine at the base of the pectoral fins; lateral line straight.

A very doubtful species seen by Mr. Audubon. It comes sometimes in shoals in March, and soon disappears. Only taken with the seine, not biting at the hook; vulgar name, Brown Sucker. The mouth is very remarkable, being broader than the head, somewhat projecting on the sides; length one foot. The head resembles that of a Cat-fish, but has no barbs. Is it a peculiar genus owing to the mouth and pectoral spine? It might be called *Eurystomus*. The yellow color covers the forehead and reaches to the anal fin. Dorsal opposed to the abdominal and trapezoidal, pectorals elliptical, yellow.

* 5th subgenus, **DECACTYLUS**. (p. 60.)

66th species, Pittsburgh Sucker, **CATOSTOMUS DUQUESNI**, *Catostome duquesne*. (p. 60.)

MYXOSTOMA DUQUESNII (Le S.) Jor.

67th species, Long Sucker, **CATOSTOMUS ELONGATUS**, *Catostome alonge*. (p. 60.)

CYCLEPTUS ELONGATUS (Le S.) Ag.

XXI. Genus, SUCKREL, CYCLEPTUS, Cyclepte. (p. 61.)

68th species, Black Suckrel, **CYCLEPTUS NIGRESCENS**, *Cyclepte noiratre*. (p. 61.)

CYCLEPTUS ELONGATUS (Le S.) Ag.

A very poor description, "on the authority of Mr. Bollman, of Pittsburgh".

† **XXII. Genus, CATFISH, PIMELODUS, Pimelode**. (p. 61.)

Subgenus, **ICTALURUS**. (p. 61.)

1st section, **ELLIOPS**. (p. 62.)

Tail forked. Eyes elliptical. Abdominal fins with less than nine rays.

69th species, Spotted Catfish, **PIMELODUS MACULATUS**, *Pimelode tachete*. (p. 62.)

ICHTHÆLURUS PUNCTATUS (Raf.) Jor.

Silurus punctatus Raf., 1818.

70th species, Blue Catfish, **PIMELODUS CERULESCENS**, *Pimelode bleuatre*. (p. 63.)

ICHTHÆLURUS PUNCTATUS (Raf.) Jor.

* Body nearly cylindrical, abdominal fins with 10 rays; tail equally forked.

Besides the two following species, the *C. bostoniensis* and *C. hudsonius* must be enumerated here.

† Body scaleless, elongated. Head large, with barbs. Two dorsal fins, the second adipose and separated from the tail, the first short and commonly armed. Pectoral fins commonly armed. Teeth like a file. Vent commonly posterior.

The extensive genus *Silurus* of Linnæus, which is scattered throughout the rivers of both continents, has not yet been completely illustrated, notwithstanding the labors of the modern ichthyologists. I have found in the Ohio about twelve species belonging to it, most of which offer consimilar character, and appear to belong to the genus *Pimelodus* of Lacépède and Cuvier, which have left the name of *Silurus* to the species having one dorsal fin. I have already published a monography of them in the Journal of the Royal Institution of London, under the generic name of *Silurus*. I now propose to form with them a peculiar *subgenus*, divided in many sections, and different from the subgenera *Bagrus*, *Synodontus*, *Silusox*, &c.

71st species, White Catfish, *PIMELODUS PALLIDUS*, Pimelode pale.
(p. 63.)

ICHTHÆLURUS PUNCTATUS (Raf.) Jor.

72d species, Silvery Catfish, *PIMELODUS ARGYRUS*, Pimelode argyre.
(p. 64.)

ICHTHÆLURUS PUNCTATUS (Raf.) Jor.

2d section, *LEPTOPS*. (p. 64.)

Tail bilobed. Eyes round and small. Nine abdominal rays. Vent posterior. Adipose fin large.

73d species, Clammy Catfish, *PIMELODUS VISCOSUS*, Pimelode visqueux. (p. 64.)

PELODICHTHYS OLIVARIS (Raf.) Gill & Jor.

Jaws nearly equal, barbs very short, eyes round, over the head. Body entirely brown, lateral line raised upwards before. Pectoral fins with 1 and 7 rays, anal fin rounded with 15 rays. Tail unequally bilobed and black, upper lobe smaller and white.

75th species, Clouded Catfish, *PIMELODUS NEBULOSUS*, Pimelode nebuloux. (p. 64.)

PELODICHTHYS OLIVARIS (Raf.) Gill & Jor.

This species is made to form a "peculiar section or even subgenus", termed *Opladelus*.

2d section, *AMEIURUS*. (p. 65.)

Tail entire. Eyes round. Eight abdominal rays. Vent posterior. Dorsal fin anterior with a spine. Lower jaw not longer. Pectoral fins with one simple spine and seven rays.

75th species, Yellow Catfish, *PIMELODUS CUPREUS*, Pimelode cuivre.
(p. 65.)

AMIURUS LIVIDUS CUPREUS (Raf.) Jor.

*76th species, Brown Catfish, *PIMELODUS LIVIDUS*, Pimelode livide.
(p. 65.)

AMIURUS LIVIDUS (Raf.) Jor.

Amiurus catus (Grd.) Gill. (Not *Silurus catus* L.)

* Jaws equal, barbs nearly equal together and as long as the head. Eyes round. Body entirely of a livid-brown color. Tail rounded entire. Lateral line raised upwards at the base. Anal fin elongate with 25 rays.

Silurus lividus, Monogr. sp. 7.

A small species, entirely of a leaden brown. Head short, slightly olivaceous; throat pale. Barbs equal, the upper ones livid, the lower ones rufous. A furrow on the head which is convex above. Operculum flexuose. Tail with 24 rays. Dorsal with 1 and 7. Spines short.

* 77th species, Black Catfish, **PIMELODUS MELAS**, Pimelode noir. (p. 66.)

AMIURUS MELAS (Raf.) Jordan.

Amiurus obesus Gill.

† 78th species, Yellow-Head Catfish, **PIMELODUS KANTHOCEPHALUS**, Pimelode xanthocephale. (p. 66.)

AMIURUS KANTHOCEPHALUS (Raf.) Gill.

4th section, **ILICTIS**. (p. 66.)

Tail entire, eyes elliptical. Nine abdominal rays. Dorsal fins sub-medial. Pectoral fins with one flat spine serrated outwards and nine rays. Lower jaw longer.

79th species, Mud-Catfish, **PIMELODUS LIMOSUS**, Pimelode bourbeux. (p. 66.)

PELODICTHYS OLIVARIS (Raf.) Gill & Jor.

‡ **XXIII. Genus, MUDCAT, PELODICTIS**, Pylodictæ. (p. 67.)

PELODICTIS Raf., 1819.

OPLADELUS Raf., 1820.

HOPLADELUS Gill, 1861.

PELODICTHYS Gill & Jordan, 1877.

* Jaws nearly equal. Eyes round. Barbs unequal, shorter than the head. Body entirely black, lateral line straight. Anal fin with 20 rays. Tail nearly truncate, entire.

Silurus melas, Monogr. sp. 8.

A rare species less than a foot long. Hardly pale beneath. Dorsal fin 1 and 7. Found below the falls.

† Upper jaw longer. Barbs unequal, shorter than the head. Eyes round. Body iron gray, with the whole or part of the head yellow. Belly white. Lateral line straight. Anal fin with 22 rays. Tail entirely truncate.

Silurus xanthocephalus, Monogr. sp. 10.

About a foot long. In the Ohio, Kentucky, etc. Head very large, often entirely yellow, or only forward, or covered with yellow patches. Iris white. Fins fleshy reddish. The dorsal with 1 and 6 rays, caudal 24. Good food.

‡ Body scaleless, conical, flattened forwards and compressed behind. Head very broad and flat, with barbs, eyes above the head. Two dorsal fins, both with soft rays. Vent posterior.

This genus was the 10th of my Prod. of 70 N. G. of animals. The name means Mudfish. It differs principally from the foregoing by the second dorsal having rays.

* 80th species, Toad Mudcat, *PYLODICTIS LIMOSUS*, *Pylodictes bourbeux*. (p. 67.)

PELODICHTHYS OLIVARIS (Raf.) G. & J.

† XXIV. Genus, BACKTAIL, *NOTURUS*, *Noture*. (p. 67.)

‡ 81st species, Yellow Backtail, *NOTURUS FLAVUS*, *Noture jaune*. (p. 68.)

NOTURUS FLAVUS Raf.

XXV. Genus, TOTER, *HYPENTELIUM*, *Hypentele*. (p. 68.)

82d species, Ohio Toter, *HYPENTELIUM MACROPTERUM*, *Hypentele macroptere*. (p. 68.)

HYPENTELIUM NIGRICANS (Le Sueur.) Jor.

Catostomus nigricans Le Sueur (young).

Hylomyzon nigricans (Le S.) Ag.

Hypentelium nigricans (Le S.) Jordan.

Description very good. If *Catostomus nigricans* be considered generically distinct from *C. hudsonius*, we have no alternative but to substitute *Hypentelium* for *Hylomyzon* of later date.

* Lower jaw longer, eyes round, eight barbs, four above and four below. Head verrucose above. Body brown, clouded, and dotted with yellowish, reddish, and bluish; one row of transversal black lines on each side of the back. No lateral line. Tail entire and truncate.

I have not seen this fish, but describe it from a drawing of Mr. Audubon. It is found in the lower part of the Ohio and in the Mississippi, where it lives on muddy bottoms, and buries itself in the mud in the winter. It reaches sometimes the weight of 20 pounds. It bears the name of Mudcat, Mudfish, Mud-Sucker, and Toadfish. It is good to eat, and bites at the hook. The head is broader than the body, and with a very large mouth; the barbs appear to lie in four pairs, two above, longer and near the nostrils, and two smaller under the lower jaw. The first dorsal fins triangular and above the abdominals, which are nearer the pectorals than to the anal. Second elongate with many rays. Number of rays unnoticed.

† Difference from *G. Pimelodus*, *S. G. Ictalurus*, and sect. *Ameiurus*: Adipose dorsal fin very long, decurrent, and united with the tail, which is decurrent on each side, but unconnected with the anal fin.

Genus 18th of the Prodr. N. G. It differs from the genus *Plotosus* of Lacépède by having the anal fin free, and from *Pimelodus* by the connection of the tail with the second dorsal fin. The name means "tail over the back". The *Silurus pygmaeus* of Mitchill must belong to this genus.

‡ Entirely yellowish. Upper jaw longer, barbs half the length of the head. Eyes round. Lateral line nearly straight. Anal fin with 14 rays. Tail entirely truncate.

A small species, very common near the falls. Length 4 to 12 inches. It agrees in almost everything with the section *Ameiurus* among the Catfishes. Vulgar name Yellow Catfish, like the *Pimelodus capreus*. Dorsal fin with 1 and 7 rays, rounded spine very short and obtuse. Second dorsal beginning before the anal and extending to the tail in a curve. All the lower fins rounded. Pectorals with 1 and 7 rays, spine equal and acute. Abdominal fins with 8 rays. All the fins fleshy and fat. Head flat above. Barbs unequal. Belly convex. Hind part of the body compressed.

XXVI. Genus, RIBBON-FISH, SARCHIRUS, Sarchire. (p. 69.)

83d species, Ohio Ribbon-Fish, SARCHIRUS VITTATUS, Sarchire rubanne. (p. 69.)

Lepidosteus sp. (young).

Description inaccurate.

* XXVII. Genus, PIKE, ESOX, Brochet. (p. 70.)

† 84th species, Streaked Pike, ESOX VITTATUS, Brochet raye. (p. 70.)

Thus far unrecognized.

‡ 85th species, Sa'mon-Pike, ESOX SALMONEUS, Erochet saumonne. (p. 71.)

ESOX SALMONEUS Raf.

? *Esox umbrosus* Kirtland.

Description probably second hand and not very good. It is probably *Esox umbrosus*, which species abounds in the bayons of the Ohio, but

* Body cylindrical or very long, covered with small scales, vent posterior. One dorsal fin behind the abdominal fins. Mouth large, jaws long and flattened, with very strong teeth; opening of the gills very large. Head bony, scaleless. Tail not oblique. All the fins with rays.

There are several species of Pikes in the Ohio, Mississippi, Wabash, Kentucky, &c. I have not yet been able to observe them thoroughly. I have, however, procured correct accounts and figures of two species; but there are more. They appear to belong to a peculiar subgenus distinguished by a long dorsal fin, a forked tail, and the abdominal fins anterior, being removed from the vent. It may be called *Picorellus*. The French settlers of the Wabash and Missouri call them *Picaneau*, and the American settlers Pikes or Pickerels. They are permanent but rare fishes, retiring, however, in deep waters in winter. They prefer the large streams, are very voracious, and grow to a large size. They prey on all the other fishes except the Gar-fishes, &c. They are easily taken with the hook, and afford a very good food, having a delicate flesh.

† White, with two blackish longitudinal streaks on each side, back brownish; jaws nearly equal, very obtuse, eyes large and behind the mouth; dorsal fins longitudinal between the abdominal and anal fins; tail forked.

E. vittatus. Raf. in American Monthly Magazine 1818, volume 3, page 447.

This fish is rare in the Ohio (although it has been seen at Pittsburgh), but more common in the Wabash and Upper Mississippi. It is called *Picaneau* or *Picaneau* by the Canadians and Missourians. It reaches the length of from three to five feet. The pectoral and abdominal fins are trapezoidal, the anal and dorsal longitudinal with many rays and nearly equal. It is sometimes called Jack or Jackfish. Lateral line straight.

‡ White, with many narrow transversal brown bands, somewhat curved; jaws nearly equal, very obtuse; dorsal fins brown, longitudinal and extending over the anal fins; tail forked and brown.

It is one of the best fishes in the Ohio; its flesh is very delicate, and divides easily, as in Salmon, into large plates as white as snow. It is called Salmon Pike, White Pike, White Jack or White Pickerel, and *Picaneau blanc* by the Missourians. *It has a short and thick head, eyes not very large, and situated upwards. Pectoral and abdominal fins trapezoidal. Dorsal fin beginning behind these last and extending over the anal. The number of transversal bands is twelve or more, rather distant, and with the concavity towards the head. It reaches the length of 5 feet. Lateral line nearly straight.*

the statement that it "reaches the length of 5 feet" renders the identification doubtful. I have never seen it more than a foot long. The name *Picorellus* may be retained for the section of *Esor*, which has the cheeks and opercles entirely scaly, if a subgeneric name for that group is considered desirable.

XXVIII. Genus, GARFISH, LEPISOSTEUS, Lepisoste. (p. 71.)

1st subgenus, **CYLINDROSTEUS.** (p. 72.)

86th species, Duck-Bill Garfish, **LEPISOSTEUS PLATOSTOMUS**, *Lepisoste platostome.* (p. 72.)

LEPIDOSTEUS PLATYSTOMUS Raf.

Description fair.

87th species, White Garfish, **LEPISOSTEUS ALBUS**, *Lepisoste blanc.* (p. 73.)

Probably same as preceding.

88th species, Ohio Garfish, **LEPISOSTE OXYURUS**, *Lepisoste oxyure.* (p. 73.)

LEPIDOSTEUS OSSEUS (L.) Ag. (probably).

89th species, Long-Bill Garfish, **LEPISOSTEUS LONGIROSTRIS**, *Lepisoste longirostre.* (p. 74.)

LEPIDOSTEUS OSSEUS (L.) Ag.

2d subgenus, **ATRACTOSTEUS.** (p. 75.)

Atractosteus Grd. and authors.

Litholepis Raf. Am. Monthl. Mag. 1818, III, 447.

90th species, Alligator-Garfish, **LEPISOSTEUS FEROX**, *Lepisoste feroce.* (p. 75.)

LITHOLEPIS SPATULA (Lacép.) Jor.

Atractosteus ferox (Raf.) Grd.

Litholepis adamantinus Raf.

Description pretty good. The generic name *Litholepis*, having two years' priority, must supersede *Atractosteus*. The specific name *spatula* (Lacépède) antedates both *adamantinus* and *ferox*.

* **XXIX. Genus, DIAMOND-FISH, LITHOLEPIS, Litholepe.** (p. 76.)

* Body fusiform, covered with hard, stony peltaedrial scales, vent nearly medial. Abdominal fin near the vent. One dorsal fin opposite the anal. Head bony, scaleless, protruded anteriorly in a long snout; mouth beneath the head; jaws not elongated, with strong unequal teeth. Opening of the gills very large. Tail not oblique. All the fins with rays.

A very singular genus, which comes very near to the last genus, but differs by the snout, mouth, tail, scales, &c. It must belong, however, to the same family. The name means *Stony Scales*.

* 91st species, Devil-Jack Diamond-fish, *LITHOLEPIS ADAMANTINUS*, *Litholepis adamantin.* (p. 76.)

LITHOLEPIS SPATULA (Lac.) Jor.

Description at second hand and erroneous in several respects, but unquestionably referring to the Alligator-Gar.

XXX. Genus, *EEL, ANGUILLA*, Anguille. (p. 77.)

Subgenus *CONGER*. (p. 77.)

† 92d species, Broad-Tail Eel, *ANGUILLA LATICAUDA*, Anguille large queue. (p. 77.)

ANGUILLA VULGARIS Fleming.

Anguilla bostoniensis (Le Sueur) Dekay and of authors.

Anguilla rostrata (Le Sueur) Dekay (the earliest American name).

If, as is claimed by Dareste, there is but one species of *Anguilla* in the northern hemisphere, the four species of Rafinesque belong to it. *Muraena rostrata* (Le S.), applied to the eel of the inland lakes of New York, is the oldest American name.

93d species, Black Eel, *ANGUILLA ATERRIMA*, Anguille noire. (p. 75.)

94th species, Yellow-Belly Eel, *ANGUILLA XANTHOMELAS*, Anguille xanthomele. (p. 78.)

* Snout obtuse, as long as the head; head one-fourth of total length; body fusiform blackish; dorsal and anal fins equal and with many rays; tail bilobed, lateral line obsolete.

Litholepis adamantinus Raf. in American Monthly Magazine 1818, vol. 3, p. 447, and in *Journal de Physique et Hist. Nat.* 70, N. G. d'Animaux G. 20.

This may be reckoned the wonder of the Ohio. It is only found as far up as the falls, and probably lives also in the Mississippi. I have seen it, but only at a distance, and have been shown some of its singular scales. Wonderful stories are related concerning this fish, but I have principally relied upon the description and figure given me by Mr. Audubon. Its length is from 4 to 10 feet. One was caught which weighed 400 pounds. It lies sometimes asleep or motionless on the surface of the water, and may be mistaken for a log or a snag. It is impossible to take it in any other way than with the seine or a very strong hook, the prongs of the gig cannot pierce the scales which are as hard as flint, and even proof against lead balls! Its flesh is not good to eat. It is a voracious fish. Its vulgar names are Diamond Fish (owing to its scales being cut like diamonds), Devil Fish, Jack Fish, Garjack, &c. The snout is large, convex above, very obtuse; the eyes small and black; nostrils small, round before the eyes; mouth beneath the eyes, transversal with large angular teeth. Pectoral and abdominal fins trapezoidal. Dorsal and anal fins equal, longitudinal, with many rays. Tail obtusely and regularly bilobed. The whole body covered with large stone scales, lying in oblique rows; they are conical, pentagonal and pentaedral, with equal sides from half an inch to one inch in diameter, brown at first but becoming of the color of turtle shell when dry. They strike fire with steel! and are ball proof!

† One individual of this species poisoned once slightly a whole family, causing violent colicks, which was ascribed to its having been taken in the vitriolic slate rocks of Silver Creek, near the falls.—(Raf.)

95th species, Yellow Eel, *ANGUILLA LUTEA*, *Anguilla jaune*. (p. 78.)

XXXI. Genus, STURGEON, ACCIPENSER, *Eturgeon*. (p. 76.)

1st subgenus, *STURIO* (5 rows of plates). (p. 79.)

96th species, Spotted Sturgeon, *ACCIPENSER MACULOSUS*, *Eturgeon tachete*. (p. 79.)

ACCIPENSER MACULOSUS Le S. and authors.

97th species, Shovel-Fish Sturgeon, *ACCIPENSER PLATORHYNCHUS*, *Eturgeon pelle*. (p. 80.)

SCAPHIRHYNCHOPS PLATYRHYNCHUS (Raf.) Gill.

2d subgenus, *STERLETUS* (3 rows of plates). (p. 80.)

98th species, Fall Sturgeon, *ACCIPENSER SEROTINUS*, *Eturgeon tard.f.* (p. 80.)

This and the next are probably *Acipenser rubicundus* Le Sueur, but I can throw no new light on this perplexing subject.

99th species, Ohio Sturgeon, *ACCIPENSER CHIENSIS*, *Eturgeon de l'Ohio*. (p. 81.)

100th species, Big-Mouth Sturgeon, *ACCIPENSER MACROSTOMUS*, *Eturgeon beant*. (p. 81.)

XXXII. Genus, DOUBLE-FIN, DINECTUS, *Dinecte*. (p. 82.)

A sturgeon with "two dorsal and no abdominal fins".

101st species, Flat-Nose Double-Fin, *DINECTUS TRUNCATUS*, *Dinecte camus*. (p. 82.)

Description from a drawing by Mr. Audubon, which represents, as suggested by Rafinesque, "only a sturgeon incorrectly drawn".

XXXIII. Genus, SPADE-FISH, POLYODON, *Polyodon*. (p. 82.)

102d species, Western Spade-Fish, *POLYODON FOLIUM*, *Polyodon feuille*. (p. 82.)

POLYODON FOLIUM Lacépède.

Description mainly correct.

XXXIV. Genus, PADDLE-FISH, PLANIROSTRA, *Planirostre*.

103d species, Toothless Paddle-Fish, *PLANIROSTRA EDENTULA*, *Planirostre edente*. (p. 83.)

POLYODON FOLIUM Lacépède (adult).

XXXV. Genus, LAMPREY, PETROMYZON, Lamproie. (p. 84.)

* 104th species, Black Lamprey, PETROMYZON NIGRUM, Lamproie noire. (p. 84.)

AMMOCETES NIGER (Raf.) Jor.

Petromyzon niger Grd.

Description insufficient, but I am unable to find that the common little Black Lamprey of the West has received any other name.

SUPPLEMENT. (p. 85.)

† XXXVI. Genus, SPRING-FISH, PEGEDICTIS, Pegedicté. (p. 85.)

ETHEOSTOMA Raf. Gill & Jordan emend.

CATONOTUS Agassiz.

‡ 105th species, Cat's-Eye Spring-Fish, PEGEDICTIS ICTALOPS, Pegedicté œuil de chat. (p. 85.)

ETHEOSTOMA FLABELLARIIS Raf.

Description indifferent. The characters indicate a species of Darter, and the eight dorsal spines point to the *flabellaris*.

6th genus, ETHEOSTOMA. (p. 85.)

106th species, Springs Hogfish, ETHEOSTOMA FONTINALIS, Etheostome des fontaines. (p. 86.)

ETHEOSTOMA FLABELLARIIS Raf.

Description very good.

* Entirely blackish, tail oval acute, second dorsal over the vent, several rows of teeth.

A very small species, from 4 to 5 inches long; it is found as high as Pittsburgh. Dorsal fins shallow, and distant from each other and the tail. Eyes round and large. Branchial holes small. No lateral line. Mouth oval, teeth white and yellow. It torments sometimes the Buffalo-fish and Sturgeons upon which it fastens itself. It is never found in sufficient quantity to be used as food.

† Body conical, with *small scales*, belly flat, vent medial. Head broad, scaleless, gill covered with a membranaceous appendage and a concealed spine, mouth toothed. Two dorsal fins, the first with simple, soft, semi-spinescent rays. Thoracic fins with five rays.

This new genus belongs to the family *Percidia* and has many affinities with the *G. Holocentrus*, *Lepomis*, *Etheostoma*, &c., but its conical form and many other secondary peculiarities distinguish it completely. The name means Fountain-fish.

‡ Jaws equal, forehead knobby, eyes elliptical. Body *olivaceous with some black transverse unequal brown bands*; a concealed spine on the gill cover; lateral line straight; tail elliptical. The first dorsal fin with 8 rays, the second with 12, as well as the anal and pectoral fins.

I have discovered this species in the summer of 1820 near Lexington. It has no vulgar name. Length hardly 2 inches. Head large, brown, convex above, with several small knobs on the forehead, flat beneath. Eyes as in the Catfishes with oblong eyes, iris gilt brown. Spine of the gill cover concealed under the skin. Teeth small and acute. *Pectoral fins large lanceolate*. Belly white and flat. Fins hyalin with some brown spots. Five transversal bands. The specific name means cat's eye.

17th genus, **SEMOTILUS**. (p. 86.)

* 107th species, Silver-Spotted Chubby, **SEMOTILUS ? NOTATUS**, *Semotile tache*. (p. 86.)

ZYGONECTES NOTATUS (Raf.) Jor.

Zygoneetes olivaceus (Storer) Agassiz.

This description evidently refers to some Cyprinodont fish. The translucent spot on the head of *Zygoneetes* is so characteristic and conspicuous in life that I have no doubt that Rafinesque had that common species in mind.

26th genus, **SARCHIRUS**. (p. 86.)

† 108th species, Silver Ribbon-Fish, **SARCHIRUS ? ARGENTEUS**, *Sarchire argente*. (p. 86.)

Unidentifiable.

Description erroneous and insufficient.

31st genus, **ACCIPENSER**. (p. 86.)

109th species, Gourd-Fish Sturgeon, **ACCIPENSER LAGENARIUS** *Eturgeon gourde*. (p. 86.)

? *Polyodon folium*.

Description second hand and erroneous.

XXXVII. Genus, SAWFISH, PRISTIS, Poisson-scie. (p. 86.)

110th species, Mississippi Sawfish, **PRISTIS MISSISSIPPIENSIS**, *Poisson-scie du Mississippi*. (p. 86.)

PRISTIS ANTIQUORUM Shaw.

Passable description (of the saw only).

† **XXXVIII. Genus, HORNFISH, PROCEROS**, *Proceros*. (p. 87.)

* Breadth one-sixth of the length, brownish, pale beneath; head small obtuse with a large silver spot on the forehead before the eyes, jaws nearly equal; dorsal fin opposed to the anal, tail oboral entire.

It is found in the *Cumberland River* and the *Little River*, a branch of it. Communicated by Mr. Wilkins. It is rather doubtful whether it belongs to this genus, or *Momnilus*, *Rutilus*, &c. It might perhaps be found to constitute a peculiar one by the small mouth without lips, and the posterior dorsal fin. Vent posterior. Pectoral and abdominal fins oboral. Eyes large. Length 3 inches; good bait for Perch, Bass, Red-eyes or Ring-eyes, &c.

† Entirely silvery, without bands or spots.

Communicated by Mr. Owings. It is found in *Licking River*, *Slate Creek*, &c. Length from two to three feet. It is called Pike, and may be one, but as it is described without scales and very slender, I have added it to this genus until it is better known.

‡ Apodal. Body elongated. Vent posterior. One dorsal fin opposed to the anal. Mouth beneath transversal toothed. Snout protruded in a straight horn. Four spiracles or branchias on each side.

Singular new genus of the family of Sharks or *Antacea*, from which however it differs by the want of abdominal fins. There are two species of it; the second, which I have called *Proceros rittalus*, lives in *Lake Ontario*, and has longitudinal stripes.

* 111th species, Spotted Horn-Fish, *PROCEROS MACULATUS*, *Proceros tachete*. (p.87.)

A myth; description evidently second hand. What fish, if any, suggested it is past my guessing.

IV.—LIST OF SPECIES NOT NOTICED BY RAFINESQUE.

The following species occurring in the valley of the Ohio, most of them within a radius of one hundred miles from Lexington, do not seem to have been noticed by Rafinesque. These species are given upon the authority of the present author unless otherwise noted. In case no particular locality is mentioned, the species is supposed to be generally diffused. Various other nominal species have been described from the Ohio Valley, but I omit all of whose validity I am not reasonably certain.

Microperca punctulata Putnam.—White River, Indiana.

Bolcichthys eos Jordan & Copeland.—Wabash River.

Paeilichthys variatus (Kirt.) Ag.—Everywhere.

Paeilichthys spectabilis Ag.

Nanostoma zonalis (Cope) Jor.—Miami River (Cope).

Nothonotus camurus (Cope) Jor.

Nothonotus sanguifluus (Cope) Jor.—Cumberland River (Cope).

Nothonotus maculatus (Kirt.) Ag.

Pleurolepis pellucidus Ag.

Alvordius aspro Cope & Jordan.

Ericosma evlens Jordan & Copeland.—White River.

Rheocrypta copelandi Jor.—White River.

Imostoma shumardii (Grd.) Jordan.—Wabash River.

Diplesium simoterum (Cope) Copeland.—Rock Castle River.

Alvordius phoxocephalus (Nelson) Cope & Jor.—Wabash River.

Percina manitou Jor.—Wabash River.

Sandrus canadensis (Smith) Jor.—Ohio River. Introduced.

Stizostethium vitreum (Mit.) Jord.—Ohio River. (Introduced.?)

Morone interrupta Gill.—Lower Ohio.

Centrarchus irideus (Lac.) C. & V.—Lower Ohio.

Pomoxys nigromaculatus (Le Sueur) Grd.—White River. Scarce.

* Iron grey, with white spots on the sides; tail forked; horn one-fourth of total length.

This fish lives in the Mississippi, and is sometimes caught at St. Genevieve, in the State of Missouri. The French settlers call it *Poisson arme*. It has no scales, but its head is bony. Eyes very small. Dorsal and anal fins rounded. Length 2 or 3 feet; very good to eat. Communicated by Mr. M——, of St. Genevieve.

- Chaenobryttus gulosus* (C. & V.) Cope.—Wabash River.
Lepiopomus pallidus (Mit.) Gill & Jord.—Everywhere.
Lepiopomus anagallinus (Cope.)—Salt River, Kentucky.
Xenotis inscriptus (Ag.) Jor.—White River.
Xenotis aurcolus Jor.
Eupomotis pallidus (Ag.) Gill & Jor.—Lower Ohio.
Eupomotis aureus (Walb.) Gill & Jor.—Introduced. (?)
Asternotremia isolepis Nelson.—Southern Illinois.
Aphododerus cookianus Jordan.—Wabash River.
Potamocottus bairdii (Grd.) Gill.—Muskingum River. (Grd.)
Potamocottus carolinæ Gill.—Cave Region, etc.
Potamocottus wilsoni (Grd.) Gill.—White River.
Lota lacustris (Walb.) Gill.—Rare. Introduced.?
Labidesthes sicculus Cope.—Abundant.
Zygonectes dispar Ag.—Wabash River.
Fundulus diaphanus (Le S.) Ag. (?)
Melanura limi (Kirt.) Ag.—Scarce.
Amblyopsis spelæus Dek.—Caves.
Typhlichthys subterraneus Grd.—Caves.
Chologaster agassizii Putnam.—Caves.
Percopsis guttatus Ag.—Rare. (Introduced. ?)
Exoglossum maxillingua (Le S.) Hald. (? ?)
Hybognathus argyritis Grd.
Hybognathus nuchalis Ag.
Ericymba buccata Cope.—Abundant.
Noemis dissimilis (Kirt.) Cope & Jor.—Common.
Rhinichthys obtusus Ag.—Common.
Phenacobius teretulus Cope.—West Virginia. (Cope.)
Phenacobius uranops Cope.—Rock Castle River.
Luxilus storerianus (Kirt.) Jordan—Kentucky. (Grd.)
Luxilus stramineus (Cope) Jordan.—White River.
Luxilus tuditanus (Cope) Jordan.—Wabash River. (Cope.)
Luxilus galacturus (Cope) Jordan.—Abundant.
Luxilus coccogenis (Cope) Jordan.—Cumberland River.
Oliola scabriceps (Cope.) Jor.
Oliola ariomma (Cope) Jor.—White River, etc.
Cyprinella analostana (Grd.) Jordan.
Photogenis spilopterus Cope.—Wabash River.

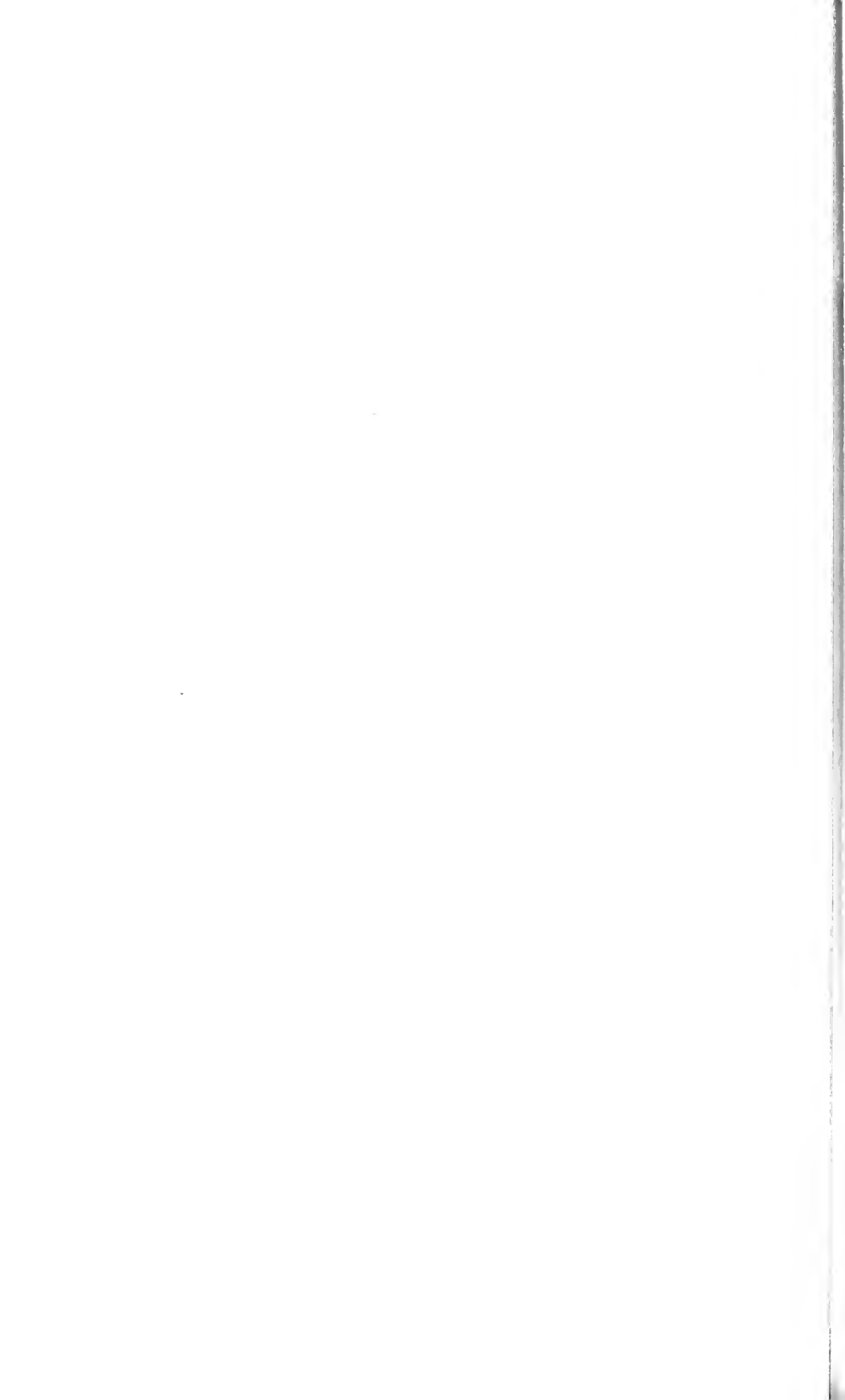
- Nototropis photogenis* (Cope) Jor.—Ohio R.
Nototropis rubrifrons (Cope) Jor.—Abundant.
Nototropis rubellus (Ag.) Jor.—Abundant.
Nototropis dilectus (Grd.) Jor.—Falls of Ohio.
Nototropis micropteryx (Cope) Jor.—Rock Castle River.
Myxostoma breviceps Cope.—Ohio River.
Placopharyx carinatus Cope.
Carpiodes bison Ag.
Carpiodes difformis Cope.
Carpiodes entisanserinus Cope.
Bubalichthys bubalinus Jor. (*Cat. bubalus* Kirt. not of Raf.)
Iethaclurus furcatus (Val.) Gill.
Ichthaclurus robustus Jor.
Amiurus natalis (Le S.) Gill.
Noturus miurus Jordan.
Noturus llaecanthus Jor.
Noturus lemniscatus (Le S.) Grd.—Ohio.
Noturus exilis Nelson.—Southern Illinois.
Amia calva L.
Ammocetes argenteus (Kirt.) Jor.—Common.

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Department of the Interior:

U. S. NATIONAL MUSEUM.

— 10 —

BULLETIN

OF THE

UNITED STATES NATIONAL MUSEUM.

No. 10.

PUBLISHED UNDER THE DIRECTION OF THE SMITHSONIAN INSTITUTION.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1877.

ADVERTISEMENT.

This work is the tenth of a series of papers intended to illustrate the collections of natural history and ethnology belonging to the United States and constituting the National Museum, of which the Smithsonian Institution was placed in charge by the act of Congress of August 10, 1846.

It has been prepared at the request of the Institution, and printed by authority of the honorable Secretary of the Interior.

JOSEPH HENRY,

Secretary of the Smithsonian Institution.

SMITHSONIAN INSTITUTION,

Washington, May, 1877.

CONTRIBUTIONS
TO
NORTH AMERICAN ICHTHYOLOGY

BASED PRIMARILY ON THE
COLLECTIONS OF THE UNITED STATES NATIONAL MUSEUM.

II.

- A.—Notes on *Cottidae*, *Etheostomatidae*, *Percidae*, *Centrarchidae*, *Aphododeridae*, *Dorysomatidae*, and *Cyprinidae*, with revisions of the genera and descriptions of new or little known species.
B.—Synopsis of the *Siluridae* of the fresh waters of North America.

BY
DAVID S. JORDAN.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1877.



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CONTRIBUTIONS
TO
NORTH AMERICAN ICHTHYOLOGY.
No. 2.

A.—NOTES ON COTTIDÆ, ETHEOSTOMATIDÆ, PERCIDÆ, CENTRARCHIDÆ, APHODODERIDÆ, UMBRIDÆ, ESOCIDÆ, DORYSOMATIDÆ, CYPRINIDÆ, CATOSTOMIDÆ, AND HYODONTIDÆ, WITH REVISIONS OF THE GENERA AND DESCRIPTIONS OF NEW OR LITTLE KNOWN SPECIES.

COTTIDÆ.

1. COTTOPSIS SPILOTUS, (Cope) Jor.

Uranidea spilota, COPE, Proc. Ac. Nat. Sci. Phila. 1865, 82.

Cottopsis ricei, NELSON, Bull. Ills. Trans. Nat. Hist., 1876.—JORDAN, Proc. Ac. Nat. Sci. Phila. 1877, 61.

An examination of the types of *U. spilota* shows their probable identity with Mr. Nelson's species as above indicated. Prof. Cope's specimens are in bad condition, and have lost the peculiar dermal spines. Prof. Gill thinks that *Cottopsis spilota* and *Cottopsis semiscaber* Cope are not truly *Cottopsis*, the only species properly referable to that genus, being *C. asper* Rich. (of which *C. parvus* Grd. is the young). At any rate, *C. spilota* and *C. semiscaber* form a well-marked group or section intermediate between *Cottopsis* and *Potamocottus*.

ETHEOSTOMATIDÆ.

2. AMMOCRYPTA BEANII, gen. et sp. nov.

Generic characters.—Allied to *Pleurolepis* Agassiz. Body greatly elongated, subcylindrical, and translucent. Head as in *Pleurolepis*, but

entirely naked; body entirely naked, except the caudal peduncle, which is sparsely covered with thin, imbedded scales, and a series of rather large scales along the sides, on which the lateral line runs; upper jaw somewhat protractile; mouth rather wide, nearly terminal; a single anal spine. The name *Ammocrypta* is given in allusion to the habit of hiding in the sand, which is characteristic of the species of this genus and *Pleurolepis*.

Specific characters.—General form of *Pleurolepis pellucidus*, but the head heavier. Depth about 6 in length (to base of caudal—as in all cases in this paper); head $3\frac{3}{4}$; mouth large, the upper jaw rather longest, and somewhat protractile; cheeks and opercles entirely naked. A series of rather large scales, about 65 in number, forming the lateral line; a few scattering scales immediately above or below lateral line; behind anal and second dorsal, the caudal peduncle is covered with small, thin, imbedded scales.

Fin rays: Dorsal X—10. Anal I, 9. The two dorsal fins very high, wide apart, about equal to each other and to the large anal. Caudal fin emarginate.

Color clear translucent, without bars or spots, the lateral line shining-golden in life (*Bean*). Spinous dorsal fin with a large black spot on the membrane anteriorly, another near the middle, and some small ones behind; other fins with their membranes dusted with small punctulations.

Habitat.—Notalbany River, near Tickfaw, La. Collected in December, 1876, by Dr. Tarleton H. Bean, of the Smithsonian Institution, for whom the species is named. The type—about $2\frac{1}{2}$ inches in length—is in the United States National Museum.

The much greater height of the dorsal and anal fins, as well as the generic character of the naked body, distinguish this species from its sand-diving relatives, *Pleurolepis pellucidus* and *P. vitreus*.

3. NANOSTOMA, Putnam, MSS., gen. nov.

The name of *Nanostoma*, a manuscript genus of Darters, has been current in ichthyological circles for some time, and it has once or twice appeared in print, but no attempt has ever been made to characterize it. I find in the National Museum two species of Etheostomoid fishes, labelled by Prof. Putnam *Nanostoma*, one of which seems to be identical with *Pacilichthys zonalis* Cope. These species cannot well be referred to *Pacilichthys*, as they have a complete lateral line. From

Boleosoma they are separated by the non-protractile upper jaw, and they seem to have little relation with the species referred to *Nothonotus*.

Nanostoma, then, appears to be a distinct genus, or at least a strongly marked section, and I propose to accept the name and to select, as the type of the group, *P. zonalis* Cope (= *N. pictum* Putnam, MSS.). *Nanostoma* bears somewhat the same relation to *Nothonotus* that *Boleichthys* does to *Pœcilichthys*.

Generic characters.—Body fusiform, little compressed, entirely scaly, without enlarged ventral plates. Mouth small, subinferior, the upper jaw not protractile; vomerine teeth; scales large; lateral line complete; cheeks and opercles scaly; dorsals well separated, the second much larger than anal, higher but rather shorter than spinous dorsal. The separation of the dorsals, the form of the body, the small size of the mouth, and the large size of the scales separate *Nanostoma* from *Nothonotus*. The scaliness of the cheeks, neck, and throat are differences of some importance.

4. HADROPTERUS TESSELLATUS, *sp. nov.*

? *Boleosoma tessellatum*, THOMPSON, Appendix Hist. Vt. p. 31, 1853 (not of De Kay, 1842).

? *Cottogaster tessellatus*, PUTNAM, Bull. Mus. Comp. Zool. i, 1863, 5.

? *Boleosoma tessellatum*, THOMPSON, *nec* De Kay, Jordan & Copeland, Bull. Buff. Soc. Nat. Hist. 1876, 135, 163.—JORDAN, Man. Vert. 1876, 222.

A specimen of an Etheostomoid in the United States National Museum, labelled *Cottogaster*, has the characters assigned by Prof. Putnam to his genus of that name, and is presumably the species which he catalogues, without description, as *C. tessellatus*. Prof. Putnam accepted the specific name from Thompson, who seems to have supposed, erroneously, that he was describing De Kay's *Boleosoma tessellatum*. Prof. Putnam states that his *Cottogaster tessellatus* is a species of *Boleosoma*, but the species now under consideration is certainly a *Hadropterus*, as I understand the latter genus. I therefore propose for my species the name of *Hadropterus tessellatus* Jordan. If Prof. Putnam's species proves different, it should be renamed, as there has been already a *tessellatum* in *Boleosoma*, and mine will keep its name. If the two are, as I suspect, identical, then we will write *Hadropterus tessellatus* (Putnam) Jordan, and no confusion in nomenclature need arise.

H. tessellatus has the form of *Imostoma shumardii*, fusiform, with a broad, heavy head; mouth wide, the upper jaw rather longest, not protractile; cheeks and opercles naked (? in life); chest naked; neck

scaly; no ventral plates; belly entirely scaled; lateral line complete; anal about equal to second dorsal.

Fin rays:—Dorsal about X—12. Anal II, 8. The soft rays barred. Coloration otherwise obliterated. Length of type $2\frac{1}{2}$ inches.

Habitat.—Foxburgh, Pa., Allegheny River. Type No. 1199, United States National Museum.

5. ERICOSMA EVIDES, *Jordan & Copeland, gen. nov.*

Alvordius evides, JORDAN & COPELAND, Proc. Acad. Nat. Sci. Phila. 1877, p. 51.

The coloration of this species, described in the paper above cited, is that of the female fish. The recent collection of a very large number of both sexes, in the breeding dress, at the same locality where the types were taken, enables me to supplement the original account. The following are the life colors of a male fish in spring:—

Lateral bars, which in the female are black or brown, a dark, rich blue-green, with metallic lustre. At the base of the bars they are somewhat connected by a narrow band of a greenish-bronze color, passing below the lateral line. Just below this is a narrow streak of yellowish—a sort of luminous, sunshine color. Above, toward the back, in each of the interspaces between the bars, is a bright blotch of bronze-red. The entire lower parts of the body are of a bright clear yellow, which becomes on the under side of the head, throat, and branchiostegals a very bright orange-red. A blackish-green bar below eye and a streak forward from it.

Dorsal fin orange-colored, with a bright bronze edge, a blackish spot on the last rays. Second dorsal and caudal pale orange; two luminous spots at base of caudal fin; anal bronze, with blue-black shading. Ventral fins dark blue-black. Pectorals faintly orange. Cheeks orange-red, exactly the color of bright iron-rust.

Males with the rays of the ventral and anal fins covered with small bluish tubercles, exactly as in some *Cyprinidae*.

This species is probably not strictly congeneric with the type of *Alvordius*. It differs from the latter genus chiefly in the less complete dentition and the reduced number of vertebræ, the latter character giving to the fish a short, compact form, quite unlike that of *Alvordius aspro* and related species. I propose to designate the group typified by *A. evides* by the name of *Ericosma* (ἔρρ, springtime; κοσμεῖν, to adorn), from the gay coloration of the males at that season.

The principal characters separating *Ericosma* from *Alvordius* are shown below.

ALVORDIUS, Grd.

(Type, *A. maculatus* Grd.)

Vertebrae numerous, about 44 in all; 22 in front of anus.

Body and head elongate; mouth wide, with well-developed teeth on vomer and on palatines.

Sexes similar; males never with the fins tuberculate.

Dorsal spines 12 to 15; the two dorsal fins well apart.

Caudal fin slightly emarginate.

ERICOSMA, Jordan.

(Type, *Alvordius evides* Jor. & Copel.)

Vertebrae fewer, about 39 in all; 17 in front of anus.

Body short and compact; mouth small, with about six minute teeth on vomer and none on palatines.

Sexes dissimilar; the males brilliantly colored, with the lower fins tuberculate.

Dorsal spines 10 or 11; the two fins contiguous.

Caudal fin deeply emarginate.

6. *RHEOCRYPTA, Jordan, gen. nov.*

Allied to *Imostoma* and *Alvordius*. Body rather slender and elongate, with a pretty large, rather long, and somewhat narrowed head, resembling that of *Boleosoma*; mouth small, horizontal, subinferior, with weak teeth in the jaws, five or six small teeth on the vomer, and none on the palatines; upper jaw protractile, separated by a distinct furrow from the forehead; two distinct dorsal fins, of which the second is rather smaller than the first and than anal; anal with two distinct spines; ventral region with a series of enlarged plates, as in *Alvordius* and *Percina*, these caducous, in many specimens replaced by a scaleless strip; cheeks naked; opercles with a few scales; lateral line complete.

This genus is perhaps nearest *Imostoma*, with which it agrees in the protractile mouth. It differs from *Imostoma* and agrees with *Alvordius* Grd. in the presence of ventral plates. The name *Rheocrypta* (ῥεῖψω, to flow rapidly—κρυπτεῖν, concealed, i. e., hiding in the rapids) is given in allusion to the peculiar habits of this interesting species.

7. *RHEOCRYPTA COPELANDI, Jordan, sp. nov.*

Head $4\frac{1}{2}$ in length; depth $5\frac{1}{2}$; eye large, $3\frac{1}{3}$ in head; scales moderate, strongly ctenoid, 56 in lateral line; those of the ventral much enlarged, forming serrated plates; cheeks naked; opercles with a few scales; neck and throat naked. Fin-rays:—Dorsal X-XII, 10; anal II, 9.

General color a semi-transparent brownish-yellow, a series of rather small horizontally oblong black spots along lateral line, forming an interrupted lateral band; back tessellated, as in *Boleosoma*, a blackish streak forward from eye and another downward; ventral fins dusky; vertical fins with dusky specks, but scarcely barred; a black spot on anterior rays of spinous dorsal.

Length of specimens 2 to 2½ inches.

Habitat.—White River, Indiana. The specimens in my possession, some thirty in number, were all taken at the same point, a shallow rapid, where the river flows over fine gravel. This locality, the "Red Bridge", about five miles north of Indianapolis, is the only one thus far known for this species and for *Ericosma evides*. It is the best point for the collection of *Pleurolepis pellucidus* which I know of in the West. As many as thirty specimens of the latter species have been taken there at low water at a single haul of the net. *Rheocrypta copelandi* and *Ericosma evides* are both extremely local, as a few rods above or below the rapids it is impossible to find either.

I dedicate this species to the memory of my friend, the late Professor Copeland, to whose patient study of these beautiful little fishes we owe much that is now known of their habits and ways. I have named this graceful species, taken at the rapids where he and I had so often fished together, for him, in recognition of his genuine love of nature, and in token of our long scientific association and personal friendship.

S. ARLINA ATRIPINNIS, *Jordan, sp. nov.*

I admit the genus *Arlina* provisionally for those species of *Boleosoma* which have two well-developed anal spines; but, as I have never seen *Arlina effulgens*, the type of the genus, I am not certain that that species possesses this character.

The species of this genus to which the above name has been given may be thus characterized:—

Body rather short for the genus, somewhat compressed behind; the depth 4½ in length. Head extremely short and deep, 4½ in length of body; the snout very short and bluntly rounded. Eye quite large, 3½ in head. Mouth quite small, with equal jaws, the upper protractile. Cheeks and opercles scaly, the scales on cheeks small and closely set; a triangular series of scales above the opercle behind the eye. Throat smooth; neck above closely scaly; no ventral plates; belly closely scaled.

Fins large; rays, dorsal XII, 10; anal II, 7. Base of spinous dorsal $1\frac{1}{3}$ times length of head, $3\frac{1}{2}$ in length; the spines high, the highest about $\frac{3}{4}$ the length of the head.

Dorsal fins contiguous, with a slight connecting membrane. Second dorsal higher, but smaller than first, its base about equal to the length of the head. Pectoral fins moderate, reaching past the middle of the dorsal.

Color olivaceous; head above entirely black; a black bar below eye; back with eight dark cross-blotches; about eleven bar-like blotches, somewhat indistinct, arranged along the lateral line. Fins chiefly black. Membranes of the second dorsal and ventral fins entirely black, that of spinous dorsal with a broad, black, horizontal bar at base, above which are numerous distinct black oblique streaks; anal with a broad black bar and caudal and pectorals largely dusky. It is likely that females, and male fish at other seasons, will be found to be paler in color.

Length of type-specimen $2\frac{1}{2}$ inches.

Collected in a tributary of the Cumberland River, near Nashville, Tenn., by Prof. A. Winchell, to whom the National Museum is indebted for a fine series of Tennessee fishes.

9. ETHEOSTOMA SQUAMICEPS, *sp. nov.*

Catnotus fontinalis, PUTNAM, MSS. (1860) (not *E. fontinalis* Raf.).

A species of the genus *Etheostoma*, found in the streams of Kentucky, has been for a long time indicated in manuscript, but has never yet been fully described.

The following account is taken from two fine specimens in the United States National Museum (No. 1345), collected by Dr. Bebb, at Russellville, Ky., and labelled *Catnotus fontinalis* by Prof. Putnam.

Body oblong, rather elongate, pretty strongly compressed, the general form being much like that of *E. flabellaris*, but with deeper caudal peduncle, the depth being about one-fifth of the length. Head large, $3\frac{1}{2}$ in length, shorter and stouter than in *E. flabellaris*; the jaws much shorter and exactly equal; eye rather large, $4\frac{1}{2}$ in head. Cheeks and opercles thickly scaly, as are the throat and region in front of the dorsal; middle line of the belly with ordinary scales. Lateral line almost complete, wanting on about ten of the posterior scales, but with occasional perforated scales behind the continuous series.

Scales about 5-50-6. Fin-rays:—dorsal IX (or VIII), 12; anal II, 7 or 8.

Spinous dorsal low and short, the spines about equal, the longest less than half the height of the soft rays of the second dorsal. The bases of the two fins are about equal, and they are slightly connected by membrane.

In the male specimen, the dorsal spines are somewhat swollen and white at their tips, but rather less so than is usual in the genus.

Color partly obliterated by the alcohol. The male is rather dark, not spotted, striped, or banded. The female is somewhat mottled, and has about six cross-blotches on the back. The second dorsal, caudal, and pectorals are barred with black and pale, the caudal especially so. The other fins are black in the male; in the female, the lower fins are pale. A large black humeral spot. Length $2\frac{3}{4}$ inches.

This species is technically an *Etheostoma*, of which genus it possesses the general form, fin coloration, and dorsal fin. It has the mouth of *Pœciliichthys*, the scaly head of *Nanostoma*, with a condition of the lateral line intermediate between *Pœciliichthys* and *Nanostoma*. The other species of *Etheostoma* have the head naked.

The specific name *fountainalis* was used by Prof. Putnam on the supposition that this species is identical with that described under the same name by Rafinesque.

ANALYSIS OF GENERA OF ETHEOSTOMATIDÆ.

The following analytical synopsis gives the characters at present assigned to the genera of *Etheostomatidæ* admitted in this paper. The categories recognized are very closely related, but are susceptible of definition:—

- *. Lateral line complete; body much elongate, subcylindrical, pellucid, with at least the entire ventral region naked:
 - a. Body entirely naked, except the caudal peduncle and the lateral line; dorsal fins high, well separated, equal to the anal fin and to each other; a single anal spine; head entirely scaleless; mouth large, with vomerine teeth, the upper jaw subprotractile.....AMMOCRYPTA, 1.
 - aa. Body covered above with small thin imbedded scales, the ventral region entirely naked, the dorsal scales obscure but present; dorsal fins small, wide apart; two anal spines; cheeks and opercles scaly; mouth large, with vomerine teeth, the upper jaw subprotractile.....PLEUROLEPIS, 2.
- **.. Lateral line complete; body less elongate, entirely scaly, or with definitely naked areas on throat, neck, or ventral line:
 - †. Second dorsal not larger than spinous dorsal, and little, if any, larger than anal; the dorsal fins distinct, the first the longer and usually the larger; body little compressed; two distinct anal spines (except in *Alvordius pellatus*, a species of uncertain affinities):

- b. Upper jaw not protractile; vomerine teeth present:
- c. Mouth narrow, inferior, overlapped by a tapering, truncate, more or less pig-like snout; ventral plates present, or, if fallen, a naked strip; body elongated; cheeks and opercles scaly; size largest of all the darters, PERCINA, 3.
- cc. Mouth wider, terminal, the upper jaw being but little longer than the lower:
- d. Ventral plates developed, or, if fallen, middle line of belly with a naked strip:
- e. Body and head elongate; the vertebrae in increased number, more than 20 in front of anus; well-developed teeth on vomer and palatines; dorsal spines 12 to 15; fins never tuberculate.....ALVORDIUS, 4.
- ee. Body and head shortened; vertebrae fewer, less than 20 in front of anus; a few minute teeth on vomer and none on palatines; dorsal spines 10 to 12; colors brilliant, the male in spring with the lower fins tuberculate, ERICOSMA, 5.
- dd. Ventral plates not developed; middle line of belly scaled like the sides, NIADROPTERUS, 6.
- bb. Upper jaw protractile, a distinct furrow separating it from the skin of the forehead:
- f. No ventral plates; posterior ventral region scaled; anterior region largely naked; vomer well toothed; head and body stout and heavy; cheeks and opercles scaly; anal fin (in adult males?) greatly elevated, reaching to base of caudal fin.....IMOSTOMA, 7.
- ff. Ventral plates well developed, or, if fallen, a naked strip; vomer with a few minute teeth; palatines naked; body rather slender, with rather narrow head and smaller subinferior mouth; cheeks naked; opercles scaly; anal fin not enlarged.....RHEOCRITYA, 8.
- tt. Second dorsal considerably larger than anal fin; no ventral plates, the middle line of the belly always covered with small scales like those of the sides:
- g. Upper jaw protractile:
- h. No teeth on vomer or palatines; mouth small, contracted, subinferior; head short and thick, with swollen cheeks; spinous dorsal rather long; cheeks and opercles scaly; anal spines strong; body elongated, little compressed, DIPLESIUM, 9.
- hh. Vomerine teeth present; dorsals contiguous, but distinct; the spinous dorsal short; head narrowed; the mouth rather small, horizontal, subinferior:
- i. Anal spines two, well developed; the first the longer.....ARLINA, 10.
- ii. Anal spine single, more or less obscure and undifferentiated from the soft rays.....BOLEOSOMA, 11.
- gg. Upper jaw not protractile:
- j. Dorsal fins well apart; body fusiform, little compressed; scales large; cheeks and opercles scaly; mouth small, horizontal, subinferior (as in *Boleosoma*); caudal peduncle rather slender.....NANOSTOMA, 12.
- jj. Dorsal fins slightly connected at base; body rather short, deep, strongly compressed; scales small; cheeks naked; mouth rather large, oblique (as in *Pacilichthys*); caudal peduncle deep.....NOTHONOTUS, 13.
- ***. Lateral line incomplete or wanting; no ventral plates; upper jaw not protractile; second dorsal larger than anal; vomer with teeth:
- k. Lateral line present on anterior part of body:
- l. Dorsal fins contiguous, the membrane of the first reaching to the base of the second:
- m. Spinous dorsal fin well developed, two-thirds or more the height of the second; the spines graduated, never ending in little fleshy knobs; lateral line extending more than half the length of the body; mouth moderate, the upper jaw usually a little the longer; opercles scaly; cheeks naked; body rather short and deep.....PACILICHTHYS, 14.

- mm.* Spinous dorsal low and small, the spines subequal, scarcely half the height of the soft rays, in males ending in little fleshy knobs; mouth rather large, the lower jaw the longest; body elongated, compressed; lateral line extending less than half the length of the body; head naked (except in the aberrant *E. squamiceps*, which is an exception to all these characters, save those drawn from the dorsal fin).....ETHEOSTOMA, 15.
- ll.* Dorsal fins about equal, well separated; body elongated; cheeks and opercles scaly:
- n.* Lower jaw longest; lateral line unknown (genus admitted provisionally, the type-species apparently has not been seen since its original description):
ALVARIUS, 16.
- nn.* Jaws about equal; lateral line curved upward over the pectorals, not reaching to middle of body; body elongated.....BOLEICHTHYS, 17.
- kk.* No lateral line; dorsal fins small, subequal, well separated; mouth small, with nearly equal jaws; scales large; size smallest of all spiny-rayed fishes,
MICROPERCA, 18.

CATALOGUE OF SPECIES OF ETHEOSTOMATIDÆ.

The following catalogue includes those species of *Etheostomatidæ* which appear to be valid, with the geographical distribution of each so far as recorded. Species unknown to me are indicated by a star (*). In arranging the genera, I begin with the type most generalized, or most like ordinary *Percidæ*, *Hadropterus*. The relations of the aberrant genera *Pleurolepis* and *Ammoerypta* are probably most with *Alvordius*, a fact which cannot well be shown in a linear series. I omit several species, which very likely may prove valid, but of whose relations I can form no definite opinion from the published accounts. In each genus, the type-species is placed first.

HADROPTERUS, *Agassiz*.

1. *Hadropterus nigrofasciatus*, Ag.—South Carolina to Tennessee and Louisiana.
2. *Hadropterus tessellatus*, Jordan.—Vermont (?) to Pennsylvania.
3. *Hadropterus aurantiacus*, (Cope) Jor.*—Virginia to Tennessee.

ERICOSMA, *Jordan*.

4. *Ericosma evides*, Jordan & Copeland.—Wabash Valley.

ALVORDIUS, *Girard*.

5. *Alvordius maculatus*, (Grd.).—Pennsylvania to North Carolina.
6. *Alvordius aspro*, Cope & Jordan.—Upper Mississippi Valley and Upper Lake Region.
7. *Alvordius nevisensis*, Cope.*—North Carolina.

8. *Alvordius peltatus*, (Stauffer,) Cope & Jor.*—Conestoga River, Pennsylvania.
9. *Alvordius macrocephalus*, Cope.—Upper Ohio Valley.
10. *Alvordius phoxocephalus*, (Nelson) Cope & Jordan.—Indiana to Tennessee and Kansas.

PERCINA, *Haldeman*.

11. *Percina caprodes*, (Raf.) Grd.—Great Lake Region to Alabama.
12. *Percina carbonaria*, (B. & G.) Grd.—Texas.
13. *Percina zebra*, Agassiz.—Great Lake Region (*d. s.*).
14. *Percina manitou*, Jordan.—Indiana to Minnesota.

RHEOCRYPTA, *Jordan*.

15. *Rheocrypta copelandi*, Jordan.—Wabash Valley.

IMOSTOMA, *Jordan*.

16. *Imostoma shumardii*, (Grd.) Jor.—Indiana to Iowa and Arkansas.

DIPLESIUM, *Rafinesque*.

17. *Diplesium blennioides*, Raf.—Mississippi Valley.
18. *Diplesium newmani*, (Ag.) Jor. & Copel.—Tennessee River.
19. *Diplesium simoterum*, (Cope) Copeland.—Cumberland and Upper Tennessee Rivers.

BOLEOSOMA, *De Kay*.

20. *Boleosoma olmstedii*, (Storer) Ag.—Great Lakes to New England and south to Georgia, east of the Alleghanies.
21. *Boleosoma atromaculata*, (Grd.) Jor.—New York to Virginia (? var.).
22. *Boleosoma nigra* (Raf.) Jor.—Mississippi Valley and Upper Great Lakes.
23. *Boleosoma æsopus*, Cope.*—Alleghany River.
24. *Boleosoma mesæa*, (Cope) Jordan.—Kansas (*d. g.*).

ARLINA, *Girard*.

25. *Arlina effulgens*, Grd.—Maryland to North Carolina (*d. g.*).
26. *Arlina stigmæa*, Jordan.—Georgia to Louisiana.
27. *Arlina maculaticeps*, (Cope) Jordan* (*d. g.*).
28. *Arlina atripinnis*, Jordan.—Cumberland River.

NANOSTOMA, *Putnam*.

29. *Nanostoma zonalis*, (Cope) Jordan.—Mississippi Valley.

NOTHONOTUS, *Agassiz*.

30. *Nothonotus maculatus*, (Kirt.) Ag.—Ohio.
 31. *Nothonotus camurus*, (Cope) Jor.—Ohio Valley.
 32. *Nothonotus sanguifluus*, (Cope) Jor.*—Cumberland River.
 33. *Nothonotus vulneratus*, (Cope) Jor.*—Tennessee to North Carolina (*d. g.*).
 34. *Nothonotus rufilineatus*, (Cope) Jordan.*—Kentucky to North Carolina.

PÆCILICHTHYS, *Agassiz*.

35. *Pæcilichthys variatus*, (Kirtland) Ag.—Upper Mississippi Valley and tributaries of Lake Erie and Lake Michigan.
 36. *Pæcilichthys spectabilis*, Agassiz.—Upper Mississippi Valley and tributaries of Lakes Erie and Michigan.
 37. *Pæcilichthys lepidus*, Girard.—Texas and west.
 38. *Pæcilichthys punctulatus*, Agassiz.—Missouri to Arkansas.
 39. *Pæcilichthys leonensis*, (Grd.) Jor. & Copel.*—Texas (*d. g.*).
 40. *Pæcilichthys grahami*, (Grd.) Jor. & Copel.*—Texas.

ETHEOSTOMA, *Rafinesque*.

41. *Etheostoma flabellaris*, Rafinesque.—Ohio Valley to Tennessee and Virginia.
 42. *Etheostoma linslii*, H. R. Storer.—Western New York (? var).
 43. *Etheostoma kenuicottii*, (Putnam) Jor.*—Illinois (*d. s.*).
 44. *Etheostoma lineolata*, (Agassiz) Jordan.—Wisconsin to Iowa (? var.).
 45. *Etheostoma squamiceps*, Jordan.—Ohio Valley, Kentucky.

ALVARIUS, *Girard*.

46. *Alvarius lateralis*, Grd.*—Texas, Mexico.

BOLEICHTHYS, *Girard*.

47. *Boleichthys exilis*, Grd.*—Upper Missouri Region.
 48. *Boleichthys eos*, Jordan & Copeland.—Tributaries of Great Lakes and Upper Mississippi River.
 49. *Boleichthys erochrous*, (Cope) Jordan.—New Jersey, Pennsylvania.
 50. *Boleichthys elegans*, Girard.—Georgia to Texas.

51. *Boleichthys gracilis*, (Grd.) Jordan.—Texas.
 52. *Boleichthys fusiformis*, (Grd.) Jordan.—Massachusetts.
 53. *Boleichthys barratti*, (Grd.) Jordan.—North Carolina to Georgia.
 54. *Boleichthys warreni*, Grd.*—Upper Missouri.

MICROPERCA, *Putnam*.

55. *Microperca punctulata*, Putnam.—Upper Mississippi Valley and tributaries of Lake Michigan.

PLEUROLEPIS, *Agassiz*.

56. *Pleurolepis pellucidus*, (Baird) Agassiz.—Ohio Valley.
 57. *Pleurolepis vitreus*, (Cope) Jord. & Copel.*—North Carolina and Tennessee.

AMMOCRYPTA, *Jordan*.

58. *Ammocrypta beanii*, Jordan.—Louisiana.

Incerte sedis.

- Etheostoma tessellata*, Storer.*—Florence, Ala. (? *Pæclichthys*).
Etheostoma cinerea, Storer.*—Florence, Ala. (? *Pæclichthys*).
Aplesion pottsii, Grd.*—Chihuahua, Mexico (? *Pæclichthys*).
Diplesion fasciatus, Grd.*—Texas (? *Pæclichthys*).

LIST OF NOMINAL SPECIES OF ETHEOSTOMATIDÆ.

The following list includes all the species of *Etheostomatidæ* described in works to which I have access, arranged in chronological order, with my identification of each. Those species of which I have examined the type-specimens are designated by a dagger (†).

| Nominal species. | Date. | Identification. |
|---|-------|---------------------------------|
| <i>Sciaena caprodes</i> , Raf. | 1818 | <i>Percina caprodes</i> . |
| <i>Etheostoma flabellaris</i> , Raf. | 1819 | <i>Etheostoma flabellaris</i> . |
| <i>Etheostoma blennioides</i> , Raf. | 1819 | <i>Diplesium blennioides</i> . |
| <i>Etheostoma flabellata</i> , Raf. | 1820 | <i>Etheostoma flabellaris</i> . |
| <i>Etheostoma nigra</i> , Raf. | 1820 | <i>Boleosoma nigra</i> . |
| <i>Pegedictis ictalops</i> , Raf. | 1820 | <i>Etheostoma flabellaris</i> . |
| <i>Etheostoma fontinalis</i> , Raf. | 1820 | <i>Etheostoma flabellaris</i> . |
| <i>Etheostoma variata</i> , Kirt. | 1840 | <i>Pæclichthys variatus</i> . |
| <i>Etheostoma maculata</i> , Kirt. | 1840 | <i>Nothonotus maculatus</i> . |
| <i>Etheostoma olmstedii</i> , Stor. | 1842 | <i>Boleosoma olmstedii</i> . |
| <i>Perca nebulosa</i> , Hald. | 1842 | <i>Percina caprodes</i> . |

| Nominal species. | Date. | Identification. |
|--|-------|---|
| <i>Pereia minima</i> , Hald | 1842 | <i>Boleosoma olmstedii</i> . |
| <i>Pileoma semifasciata</i> , De Kay | 1842 | <i>Percina caprodes</i> . |
| <i>Boleosoma tessellata</i> , De Kay | 1842 | <i>Boleosoma olmstedii</i> . |
| <i>Percina bimaculata</i> , Hald | 1843 | <i>Percina caprodes</i> . |
| <i>Etheostoma cœrulea</i> , Stor | 1845 | <i>Pœciliichthys variatus</i> . |
| <i>Etheostoma tessellata</i> , Stor | 1845 | (?) |
| <i>Etheostoma cinerea</i> , Stor | 1845 | (?) |
| <i>Pileoma zebra</i> , Ag | 1850 | <i>Percina</i> (<i>caprodes</i> var. ?) <i>zebra</i> . |
| <i>Boleosoma maculatum</i> , Ag. | 1850 | <i>Boleosoma nigra</i> . |
| <i>Etheostoma linsleyi</i> , H. R. Stor | 1850 | <i>Etheostoma</i> (<i>flabellaris</i> var. ?) <i>linslii</i> . |
| <i>Pœcilosoma erythrogaster</i> , Kirt | 1854 | <i>Pœcilichthys variatus</i> . |
| <i>Pœcilichthys spectabilis</i> , Ag. † | 1854 | <i>Pœcilichthys spectabilis</i> . |
| <i>Pœcilichthys versicolor</i> , Ag | 1854 | <i>Pœcilichthys variatus</i> . |
| <i>Pœcilichthys punctulatus</i> , Ag † | 1854 | <i>Pœcilichthys punctulatus</i> . |
| <i>Catonotus lineolatus</i> , Ag | 1854 | <i>Etheostoma</i> (<i>flabellaris</i> var. ?) <i>lineo-</i> <i>lata</i> . |
| <i>Hadropterus nigrofasciatus</i> , Ag | 1854 | <i>Hadropterus nigrofasciatus</i> . |
| <i>Hyostoma newmani</i> , Ag. † | 1854 | <i>Diplesium newmani</i> . |
| <i>Boleosoma fusiforme</i> , Grd. † | 1854 | <i>Boleichthys fusiformis</i> . |
| <i>Boleosoma barratti</i> , Holbr. | 1855 | <i>Boleichthys barrattii</i> . |
| <i>Pileoma carbonaria</i> , B. & G. † | 1856 | <i>Percina carbonaria</i> . |
| <i>Pœcilichthys lepidus</i> , B. & G. † | 1856 | <i>Pœcilichthys lepidus</i> . |
| <i>Arlina effulgens</i> , Grd | 1859 | <i>Arlina effulgens</i> . |
| <i>Estrella atramaculata</i> , Grd | 1859 | <i>Boleosoma</i> (<i>olmstedii</i> var. ?) <i>atroma-</i> <i>culata</i> . |
| <i>Oligocephalus humeralis</i> , Grd | 1859 | <i>Etheostoma flabellaris</i> . |
| <i>Alvordius maculatus</i> , Grd. † | 1859 | <i>Alvordius aspro</i> . |
| <i>Catonotus fasciatus</i> , Grd | 1859 | <i>Etheostoma flabellaris</i> . |
| <i>Hadropterus maculatus</i> , Grd | 1859 | <i>Alvordius maculatus</i> . |
| <i>Hadropterus shumardii</i> , Grd. | 1859 | <i>Imostoma shumardii</i> . |
| <i>Alvarius lateralis</i> , Grd | 1859 | <i>Alvarius lateralis</i> . |
| <i>Diplesium fasciatus</i> , Grd | 1859 | <i>Pœcilichthys</i> sp. (?) |
| <i>Aplesion pottsi</i> , Grd | 1859 | <i>Pœcilichthys</i> sp. |
| <i>Oligocephalus grahami</i> , Grd | 1859 | <i>Pœcilichthys</i> sp. (?) |
| <i>Oligocephalus leonensis</i> , Grd | 1859 | <i>Pœcilichthys</i> sp. (?) |
| <i>Oligocephalus pulchellus</i> , Grd | 1859 | <i>Pœcilichthys</i> sp. (?) |
| <i>Boleosoma gracile</i> , Grd. † | 1859 | <i>Boleichthys gracilis</i> . |
| <i>Boleichthys exilis</i> , Grd | 1859 | <i>Boleichthys exilis</i> . |
| <i>Boleichthys whipplei</i> , Grd | 1859 | <i>Pœcilichthys punctulatus</i> . |
| <i>Boleichthys elegans</i> , Grd | 1859 | <i>Boleichthys elegans</i> . |
| <i>Boleichthys warreni</i> , Grd | 1859 | <i>Boleichthys warreni</i> . |
| <i>Pœcilosoma transversum</i> , Abbott † | 1860 | <i>Pœcilichthys variatus</i> . |
| <i>Pileoma cymatogrammum</i> , Abbott † | 1860 | <i>Diplesium bleunoides</i> . |

| Nominal species. | Date. | Identification. |
|--|-------|---|
| <i>Asproperca zebra</i> , Heckel | 1860 | <i>Percina caprodes</i> . |
| <i>Catanotus kennicottii</i> , Putn | 1863 | <i>Etheostoma</i> sp. |
| <i>Microperca punctulata</i> , Putn.† | 1863 | <i>Microperca punctulata</i> . |
| <i>Cottogaster tessellatus</i> , Putn | 1863 | <i>Hadropterus tessellatus</i> (?). |
| <i>Pleurolepis pellucidus</i> , (Baird) Ag | 1863 | <i>Pleurolepis pellucidus</i> . |
| <i>Pæcilichthys mesæus</i> , Cope † | 1864 | <i>Boleosoma mesæa</i> . |
| <i>Etheostoma peltatum</i> , Stauff | 1864 | <i>Alvordius peltatus</i> . |
| <i>Hololepis erochrous</i> , Cope † | 1864 | <i>Boleichthys erochrous</i> . |
| <i>Etheostoma macrocephalum</i> , Cope † | 1866 | <i>Alvordius macrocephalus</i> . |
| <i>Boleosoma brevipinne</i> , Cope † | 1868 | <i>Boleosoma nigra</i> . |
| <i>Cottogaster aurantiacus</i> , Cope | 1868 | <i>Hadropterus aurantiacus</i> . |
| <i>Pæcilichthys zonalis</i> , Cope † | 1868 | <i>Nanostoma zonalis</i> . |
| <i>Hyostoma blennioperca</i> , Cope † | 1868 | <i>Diplesium blennioides</i> . |
| <i>Hyostoma simoterum</i> , Cope | 1868 | <i>Diplesium simoterum</i> . |
| <i>Etheostoma nevisense</i> , Cope | 1870 | <i>Alvordius nevisensis</i> . |
| <i>Pæcilichthys sanguifluis</i> , Cope | 1870 | <i>Nothonotus sanguifluis</i> . |
| <i>Pæcilichthys camurus</i> , Cope | 1870 | <i>Nothonotus camurus</i> . |
| <i>Pæcilichthys rufilineatus</i> , Cope | 1870 | <i>Nothonotus</i> (?) <i>rufilineatus</i> . |
| <i>Pæcilichthys vulneratus</i> , Cope | 1870 | <i>Nothonotus</i> (?) <i>vulneratus</i> . |
| <i>Pæcilichthys vitreus</i> , Cope | 1870 | <i>Pleurolepis vitreus</i> . |
| <i>Boleosoma maculaticeps</i> , Cope | 1870 | <i>Arlina maculaticeps</i> . |
| <i>Boleosoma æsopus</i> , Cope | 1870 | <i>Boleosoma æsopus</i> . |
| <i>Plesioperca anceps</i> , Le Vaillant | 1873 | <i>Hadropterus nigrofasciatus</i> . |
| <i>Boleosoma mutatum</i> , Le Vaillant | 1873 | <i>Boleosoma nigra</i> . |
| <i>Boleichthys eos</i> , Jordan & Copeland † | 1876 | <i>Boleichthys eos</i> . |
| <i>Etheostoma phoxocephalum</i> , Nelson † | 1876 | <i>Alvordius phoxocephalus</i> . |
| <i>Alvordius evides</i> , Jor. & Copel † | 1877 | <i>Ericosma evides</i> . |
| <i>Alvordius aspro</i> , Cope & Jordan | 1877 | <i>Alvordius aspro</i> . |
| <i>Percina manitou</i> , Jor. † | 1877 | <i>Percina manitou</i> . |
| <i>Boleosoma stigmæum</i> , Jor.† | 1876 | <i>Arlina stigmæa</i> . |
| <i>Ammocrypta beanii</i> , Jor. † | 1877 | <i>Ammocrypta beanii</i> . |
| <i>Hadropterus tessellatus</i> , Jor. † | 1877 | <i>Hadropterus tessellatus</i> . |
| <i>Rheocrypta copelandi</i> , Jor.† | 1877 | <i>Rheocrypta copelandi</i> . |
| <i>Arlina atripinnis</i> , Jor.† | 1877 | <i>Arlina atripinnis</i> . |
| <i>Etheostoma squamiceps</i> , Jor. | 1877 | <i>Etheostoma squamiceps</i> . |

CENTRARCHIDÆ.

10. EUPOMOTIS.

Eupomotis, GILL & JORDAN, Field and Forest, 1877, v. 2, p. 190.

In the *Journal de Physique*, June, 1819, page 420,* Rafinesque first proposes the name *Lepomis* for the American Sunfishes, the type to be *Labrus auritus* of authors. The genus *Lepomis* he then proposes to divide into two subgenera, *Pomotis* and *Apomotis*, the former having the body rounded and the opercle auriculated, the latter having the body rounded or oblong and the opercle without auricle.

Of auriculated species, only one, *auritus*, is mentioned. This species is then obviously the type of *Pomotis*; but it had been already indicated as the type of *Lepomis*. *Pomotis* then is typical *Lepomis*, and is a simple synonym of the latter name.

In the *Ichthyologia Ohiensis*, in 1820, Rafinesque characteristically changed some of these names; *Lepomis* here becomes *Icthelis*, and *Apomotis*, *Telipomis*. *Pomotis* is still used in the same sense as before. In 1829, Cuvier and Valenciennes revived the name *Pomotis* of Rafinesque in precisely the same sense in which Rafinesque used it, but including several additional species. Cuvier does not credit the name *Pomotis* to Rafinesque, but, in accordance with a custom then as now too prevalent, in modifying the characters assigned to the genus, allowed his own name to supersede that of the earlier author. That Cuvier accepted the name *Pomotis* from Rafinesque is evident from the fact that he quotes Rafinesque's descriptions in a foot-note. *Pomotis* and *Bryttus* of Cuvier and Valenciennes are practically equivalent to *Po-*

*"13. *Lepomis* (Thoracique). Corps arrondi, ovale ou oblong, très comprimé. Tête et opercules écailleux, ceux-ci mutiques, le postérieur flexueux, membranex, quelquefois auriculé. Bouche petite, mâchoire à petits dents, lèvre supérieure à peine extensible. Une nageoire dorsale; nageoire thoracique à 6 rayons dont 1 épineux sans appendices. Anns au milieu. Ce genre est nombreux en espèces, j'en connois 7 à 8 des États-Unis; son type est le *Labrus auritus* des auteurs, sous le nom duquel il y a 4 ou 5 espèces confondues. Il diffère particulièrement du *Sparus* par son opercule écailleux et le défaut d'appendice thoracique. Il se divise en deux sous-genre: 1. *Pomotis*. Corps arrondi, opercule auriculé. 2. *Apomotis*. Corps arrondi ou oblong, opercule sans auricule; mais tous ont le corps tacheté et une tache noire sur l'opercule. J'en ai découvert deux nouvelles espèces dans l'Ohio. 1. *L. cyanelus*. Corps oblong, tout couvert de points bleus, joues à lignes flexueuses bleues, opercule sans auricule; tache oblongue, queue bilobée. 2. *L. macrochirus*. Corps ovale, points bruns, point d'auricule; tache oblongue, toute noire; pectorales très longues atteignant l'anale; queue fourchée."—(RAFINESQUE.)

motis and *Apomotis* of Rafinesque. The fact that *Pomotis* has been long in use and is a very familiar name is its only claim for retention, a claim which does not appear to justify its retention in opposition to established rules of nomenclature.

The name *Pomotis* being therefore untenable for any genus of *Centrarchidæ*, Prof. Gill and myself have proposed the name *Eupomotis* for *Sparus aureus* Walbaum (= *Pomotis vulgaris* Cuvier) and its congeners.

Three species of this genus are known from autopsy to Prof. Gill and myself—*E. aureus* (Walb.), *E. speciosus* (Holbrook), and *E. pallidus* (Agassiz).

11. EUPOMOTIS PALLIDUS, (Agassiz) Gill & Jordan.

Pomotis pallidus, AG., AM. JOURN. SCI. ARTS, 1854, 303.—JORDAN, MAN. VERT. 1876, 240.

This is a large stout species, somewhat elongate, resembling *Lepiopomus pallidus* in form and coloration. Head 3 in length; depth $2\frac{1}{2}$; eye 4. Head and profile scarcely gibbous; snout protruding; mouth rather large, somewhat oblique, reaching the front of eye; eye rather large; opercular flap wide and rounded, shorter than in *E. aureus*, with a rather wide pale border, chiefly below and behind. Scales very large, 4-35-13, about 4 rows on the cheeks. Spines rather high and strong, the longest dorsal spine as long as from muzzle past middle of pupil; soft fins high; pectorals long, but not reaching anal. Gill-rakers short and weak.

Color pale olive or brassy; no trace of blue or orange in spirits; some blackish markings on last rays, but hardly a spot. Pharyngeal teeth very strongly "paved", as in the related species. Described from No. 4157, National Museum.

Habitat.—Tennessee River (Agassiz). Mississippi River, at Saint Louis; Alabama River (specimens in National Museum).

12. XENOTIS.

Xenotis, JORDAN, PROC. ACAD. NAT. SCI. PHILA. 1877, 76.

The peculiar character of the gill-rakers, which separates this genus from *Lepiopomus*, has not yet been fully defined, and indeed a more minute study is still desirable, although it may be readily recognized. In *Lepiopomus*, the gill-rakers of the anterior branchial arch are comparatively long, somewhat firm, having apparently an ossified basis, and they are provided toward their tip, on one side at least, with minute, pointed, tooth-like roughnesses. These teeth may be readily felt with the

tweezers or seen with a hand-glass. The appendages of the anterior gill-arch only are thus enlarged, those of the other arches remaining undeveloped.

In *Xenotis*, the gill-rakers are not essentially dissimilar on the different arches. They are short, comparatively thick, soft, having a cartilaginous or unossified basis, and are nearly destitute of teeth or tooth-like roughnesses. The brilliant colors, low dorsal spines, and especially the great development of the opercular flap in *Xenotis*, form additional distinctive characters, although not independently of generic value.

13. XENOTIS SOLIS, (*Valenciennes*) Gill & Jordan.

Pomotis solis, *VALENCIENNES (1831), Hist. Nat. des Poissons, vii, 468. (Specimens sent by Le Sueur from near New Orleans. Those referred to from New York doubtless belong to *Lepiopomus auritus*.)

Numerous specimens of a sun-fish from the Tangipahoa River, Louisiana, have been identified by us with Valenciennes's species as above, and examples have been distributed by the United States National Museum under the name of *Xenotis solis*. Of course, it is not possible from Valenciennes's description to know certainly which one of our numerous similar species he had in mind, but it is safer to identify with the present species than with any other, and our *X. solis* does not seem ever to have received any other name.

Xenotis solis is an elongate species for the genus, most of the species of which are short and deep. It is, however, heavy forward, the region before the dorsal being quite prominent, forming a marked angle over the eye with the rising profile of the face. The greatest depth is $2\frac{3}{8}$ in the length. The head is large, 3 in length, without the opercular flap; $2\frac{1}{8}$ including the flap.

* The following is Valenciennes's description :—

Le POMOTIS SUN-FISH (Pomotis solis nob.).

Un autre pomotis du lac Pontchartrain, envoyé par M. Le Sueur, pourrait bien encore être d'une espèce distincte.

La couleur paraît d'être un jaune verdâtre uniforme, plus ou moins doré, sans aucune trace de taches ou de raies sur le corps et sur les nageoires. Le lambeau de l'oreille est plus long et plus étroit que dans aucun autre. Les nombres sont, D. 10-11 : A. 3-10, etc.

Il est long de quatre à cinq pouces.

Les Anglo-Américains de la Nouvelle-Orléans donnent à cette espèce le nom de *sun-fish* (poisson de soleil). M. Le Sueur ne nous explique pas ce qui a motivé cette dénomination.

Nous rapportons à cette espèce des individus mal colorés, qui nous ont été envoyés de New York par M. Milbert.

The eye is quite large, 4 in the head proper; $1\frac{1}{2}$ times in the opercular flap.

The opercular flap is quite long and narrow, narrowly bordered with pale throughout its length; its length is contained about $2\frac{1}{2}$ times in the length of the rest of the head, its width is little more than half its length. It is somewhat broadened toward the tip, and is set obliquely upward and backward. Much variation in the size and form of this appendage may be expected.

The dorsal spines are moderately developed, rather high for the genus, the longest as long as from snout to middle of orbit. The caudal peduncle in this species is rather more than usually elongate: with the caudal fin it forms about one-third of the total length.

The scales on the cheek are rather large, in five or six rows. There are 39 scales in the lateral line; about five rows above and eleven below it. Fin-rays as usual, D. X, 10; A. III, 9.

The coloration has been modified by the alcohol. It seems to have been chiefly of a greenish or golden orange in life, with numerous small pale blue spots. Blue lines on the sides of the head and in front of the eyes. The fins, now unicolor, were probably largely orange in life.

This species is related to *X. inscriptus* and *X. megalotis*. It is longer-bodied and has higher spines than *fallax*, *breviceps*, *megalotis*, and *sanguinolentus*.

Its spines are much higher than in *lythrochloris* and the flap is different. *X. inscriptus*, *anreolus*, *marginatus*, and *peltastes* are smaller, less elongate, and have a different flap. In some respects it approaches nearer *Lepiopomus auritus* than do any of the above species, and specimens of the *auritus* were apparently confounded with it by Valenciennes.

14. XENOTIS SANGUINOLENTUS, (Agassiz) Jordan.

Pomotis sanguinolentus, AGASSIZ, AM. JOURN. SCI. ARTS, 1854, 301.

This handsome species seems to be widely distributed in the Southern States; I have seen specimens from the Tennessee, Savannah, Alabama, and Mississippi Rivers. It represents, in the South, *X. megalotis* of the Northern States. *X. sanguinolentus* may be known by the rather higher spines—the longest as long as from snout just past middle of pupil—and by a peculiarity of coloration, blue spots on the sides being arranged in vertical chain-like bands, which are striking and conspicuous even after the fish has been long in alcohol.

15. *XYSTROPLITES*, *gen. nov.*

This genus bears nearly the same relation to *Eupomotis* that *Lepiopus* does to *Xenotis*. It comprises those *Centrarchidae* which, wanting the supernumerary maxillary bone, have the teeth of the lower pharyngeals blunt and paved as in *Eupomotis*, and the gill-rakers long and relatively slender as in *Lepiopus*. The pharyngeal bones themselves are much narrower and smaller than in *Eupomotis*, being in form more like those of *Xenotis*. The teeth are less strongly "paved", being smaller, less crowded, and rounded rather than truncate; on the inner border of the bone are a few enlarged acute teeth. The species of *Xystroplites*, as of *Eupomotis*, have the short rounded ear-flap bordered below and behind with orange. The type is the species below described under the name of *Xystroplites gillii*. *Pomotis heros* B. & G. also belongs to this genus. The known species strongly resemble *Lepiopus pallidus* (*incisor*) in outward characters, and lack the brilliant coloration of *Eupomotis aureus*. The name *Xystroplites* is from ξυστρον, an instrument for scraping (gill-raker), and ἐπλίτης, armed, in allusion to the armature of the gill-rakers.

16. *XYSTROPLITES GILLII*, *sp. nov.*

Head $2\frac{1}{2}$ in length; depth 2; eye about equal to flap, $4\frac{1}{2}$ in head. Body elongate, very deep in the middle, abruptly narrowed each way. Greatest depth at the beginning of dorsal; a rapid slope from this point to the base of elongate caudal peduncle; a steep curve from dorsal to occiput, where an abrupt angle is formed with the projecting snout. Top of head sloping at an angle of about 45° .

Mouth wide, lower jaw a trifle longest; maxillary reaching just past the front of the pupil. Flap moderate, broad, with a very wide pale edge below and behind. Dorsal spines moderate, as long as from snout to middle of orbit; pectorals medium, barely reaching anal. Dorsal X, 10. Anal III, 9. Scales large, 6-42-13; 5 rows on the cheek.

Coloration obliterated; apparently uniform olive; traces of dusky mottlings on last rays of dorsal and anal.

Type, No. 5995, United States National Museum, from Garden Key, Florida.

This species may be known from its congener *X. heros* by the peculiar form, and from the species of *Lepiopus* by its dentition.

17. *LEPIOPOMUS ISCHYRUS*, Jordan & Nelson, *sp. nov.*

Ichthelis aquilensis, NELSON, Bull. Ills. Mus. Nat. Hist. i, 1876, 37 (not *Pomotis aquilensis* GRD.).

Numerous young specimens purporting to be types of Baird and Girard's *P. aquilensis* are in the National Museum. Two species seem to be represented among them, the one a *Xenotis*, the other a *Lepiopomus*. Neither of them is identical with *I. aquilensis* Nelson, and as the latter species seems not to have been hitherto named, the above appellation is proposed for it.

18. *LEPIOPOMUS APIATUS*, Cope.

Lepomis apiatus, COPE, Proc. Am. Philos. Soc. 1877. (In press.)

This is a large species related to *L. macrochirus* Raf., and more closely to *L. elongatus* (Holbr.), but stouter built than either, and with marked peculiarities of coloration.

Body deep, compressed, the form somewhat as in *Eupomotis aureus*. Profile rising rapidly from the snout; the nape swollen, forming an angle above the eye; caudal peduncle deep, not especially elongated. Mouth moderate; maxillary reaching to just past anterior margin of the eye, the lower jaw projecting somewhat when the mouth is closed. A small patch of teeth on the anterior edge of the palatines (sometimes obsolete); eye large; opercular flap short and deep, considerably shorter than the eye.

Dorsal spines high, those in the middle highest, so that a slight notch is made at the beginning of the soft rays; the soft parts of the vertical fins are largely scaly. Pectoral fins moderate, barely reaching anal. Anal spines strong, the soft rays high. Longest dorsal spine nearly equal to the distance from the snout to the posterior edge of the orbit.

Head 3 in length, the depth $1\frac{1}{2}$; eye 4 in head, larger than the opercular flap, which is short and deep.

Gill-rakers rather long, stiff, pretty strongly dentate.

Fin-rays:—D. X, 11. A. III, 10.

Scales 6-40-13, those on the cheek large, in about seven rows.

Coloration somewhat altered by the alcohol. There are no spots on the fins, and there are no traces of blue lines on the cheeks. The most marked feature of coloration is the presence on various parts of the body of little dark brown or black spots, chiefly at the base of the

scales, smaller than pins' heads, about the size of the nasal openings, and resembling fly-specks.

On the lower part of the sides of the body, these spots are most distinct, and form irregular lines along the rows of scales. They are present also on the opercular region, and are more or less appreciable on most parts of the body. On some specimens, these spots are distinct over the whole body, being enlarged on the back.

The black opercular spot is very small for the genus, no larger than in the species of *Apomotis*. Besides the black spots, there are also faint pale spots at the base of some of the scales of the sides. These were perhaps conspicuous in life.

The fins generally are rather dark, unspotted; the ventral fins are black.

The length of the specimens described is from 4 to $4\frac{1}{2}$ inches.

Habitat.—St. John's River, Florida. Many specimens in the United States National Museum.

This species was indicated in MSS. some years ago by Prof. Gill, and specimens have been distributed by the Smithsonian Institution under the name *L. stercorarius* Gill. As Prof. Cope's paper will probably appear in advance of this, I have adopted his specific name, instead of publishing it as a new species.

19. LEPIOPOMUS MINIATUS, *sp. nov.*

General form of *Xenotis inscriptus*. Oblong and somewhat regularly elliptical. Head $2\frac{3}{4}$ in length; depth $2\frac{1}{4}$; eye large, $3\frac{1}{2}$ in head; opercular flap rather short and broad, entirely black; mouth rather large; scales of cheek large, in four series; scales large, 4–10–11; palatine teeth present; gill-rakers short for *Lepiopomus*, but stiff and rough. Dorsal spines rather long, as long as from snout just past middle of eye; pectorals long, reaching anal. Dorsal X, 10. Anal III, 9.

Color in spirits dark, rows of bright red or scarlet spots running lengthwise of the body; one spot on each scale, and two blackish markings on each side of the red; dorsal fin dusky behind, but unspotted; iris red. Length 4 inches.

Type, No. 16918, United States National Museum. Numerous specimens from Tangipahoa River, Louisiana. This species is perhaps most nearly related to *Lepiopomus auritus*.

20. APOMOTIS PHENAX, *Cope & Jordan, sp. nov.*

Chenobryttus phenax, COPE, MSS.

Form and appearance of *Lepiopomus pallidus*. Head $2\frac{1}{2}$ in length;

depth $2\frac{1}{5}$; eye moderate, as long as snout, rather smaller than opercular flap, about $4\frac{1}{2}$ in head. Mouth moderate, the lower jaw slightly longest, the maxillary reaching middle of eye, with a strong supplemental bone; snout short, projecting, an angle over eye. Gill-rakers very long; flap larger than in the other species of the genus.

Scales on cheek in 7 rows; on body 6-13-14. Mucous cavities strong.

Dorsal spines short and strong, as long as from snout to middle of eye; soft dorsal high, soft anal higher, both largely scaly; caudal fin emarginate; pectoral fins long, reaching anal. Dorsal X, 10. Anal III, 9.

Color in spirits uniform olive-green, paler lines along the rows of scales; soft fins somewhat mottled, but no black blotch on dorsal or anal.

This species bears much more resemblance to *Lepiopomus* and *Xystroplites* than to its congeners. From *A. cyanellus*, it differs in the greater depth and compression of the body, in the longer spines, longer opercular flap, smaller mouth, and larger scales.

Type, two specimens about six inches long, in the Museum of the Philadelphia Academy of Natural Sciences, collected at Beaseley's Point, New Jersey, by Dr. Leidy.

21. ENNEACANTHUS PINNIGER, *Gill & Jordan, sp. nov.*

A very handsome species, rather larger than any other of this genus, and with larger fins.

Body rather short, deep, compressed, regularly ovate in form; the depth half the length (without caudal); the head one-third. Eye large, $3\frac{1}{2}$ in head. Mouth rather small, very oblique, the maxillary reaching to just opposite the front of the orbit.

Dorsal spines rather long, the soft rays greatly elevated; in the male fish as long as the head, reaching, when depressed, to the middle of the caudal; in the female fish considerably shorter; anal spines long, not rapidly graduated, the longest soft rays as long as those of the dorsal.

Ventral fins elongate; the filiform tips of the longest rays in the males reaching the first soft rays of the anal, the spines falling short of the anal spines. In the females, the ventral fins are shortened and scarcely reach the anal. Pectoral fins moderate, reaching the soft rays of the anal. Caudal fin elongate, nearly as long as head. Lateral line complete.

The female fish has all of the fins very much less elevated, the

longest rays of the dorsal and anal not reaching to caudal; the scales of the body more exposed, and the coloration duller.

Fin-rays:—D. IX, 10; A. III, 10. Scales 4-33-10.

The color of the male specimens in spirits is as follows:—Body olive, with, in some cases, a very faint suggestion of lateral vertical bars; a large black spot at the angle of the opercles, with pearly-blue markings about its base; an obscure bar below eye.

A number of round, luminous, or pearly-blue spots on the sides of the head, irregular in position but very distinct; other similar spots—white in spirits, doubtless sky-blue in life—on the membranes of the vertical fins, and in scattered irregular rows along the sides of the body, in some specimens on nearly the whole surface, forming imperfect lines along the sides. Each row of spots is accompanied by two faint blackish streaks. These spots are largest and most regular in position along the middle of the sides, but most definite in outline on the belly and fins.

The female is duller in color, the flap plain black, with some pale edging, and the body with larger spots, more regular in position but not so well defined. The spots on the fins are also larger and paler.

Length of largest specimens examined $3\frac{1}{2}$ inches.

Habitat.—The types were collected at Kinston, N. C., by Mr. J. W. Milner. Upward of thirty specimens were preserved.

This species seems to be the largest and handsomest of the species of *Enneacanthus*. Its relationships are most close with the next species; but it is probably the most strongly marked of the genus. The sexual distinctions, evident in all the species, are here carried to the extreme.

22. ENNEACANTHUS MARGAROTIS, Gill & Jordan, *nom. sp. nov.*

?*Enneacanthus guttatus*, COPE (1869), Journ. Acad. Nat. Sci. Phila.—(not *Pomotis guttatus* MORRIS (1859), Proc. Acad. Nat. Sci. Phila. 9, which is *E. obesus*).

Enneacanthus obesus, JORDAN (1876), Man. Vert. 232 (excl. expression "barred", copied from Prof. Baird; specimens from Trenton, N. J., supposed to be the male of *obesus*) (not *Pomotis obesus* Grd.).

?*Enneacanthus gloriosus*, UHLER & LUGGER (1876), Fishes of Maryland—(not description, which seems to be copied from Holbrook) (not *Bryttus gloriosus* Holbr.).

No description of this common little species seems ever to have been published. Dr. Morris's notice of his *Pomotis guttatus* is very superficial, and apparently refers to *E. obesus*; the only tangible feature mentioned being the presence of black bars along the sides, which this species does not have.

The following description is taken from a large number of individuals sent by Dr. C. C. Abbott to the Smithsonian Institution from Trenton, N. J., and from others collected by Prof. Baird at Beaseley's Point, N. J.:—

Body rather short and deep, but more elongate than in any of the others; the head $2\frac{3}{4}$ in length, the depth $2\frac{1}{4}$; the eye large, longer than snout, $3\frac{1}{4}$ in head; mouth moderate, very oblique, the maxillary reaching to just past the front of the orbit.

Dorsal spines medium; the soft rays in the males somewhat elevated, reaching when depressed just to the base of the caudal; the longest soft ray as long as from the snout to the preopercular margin. In the females, the rays are shortened, but the sexual differences are much less marked than in *E. pinniger*. Anal spines long, rather rapidly graduated, the longest soft rays as long as those of the dorsal.

Ventral fins as in *E. pinniger*, the longest rays in the males filamentous and reaching the soft rays of anal; in the females shorter. Pectoral fins rather long, reaching middle of anal. Lateral line complete.

Fin-rays:—D. IX, 10; A. III, 9. Scales 3–30–9.

General coloration similar to that of *E. pinniger*. Body dark olive; very young specimens with faint traces of vertical bars; a moderate-sized opercular spot, smaller than in *E. obesus*, bordered above and below with luminous blue. Near the anterior edge of the "ear-flap" is a crescent-shaped pearly-blue spot, which, though small, is very conspicuous. Traces of a similar mark may be observed on *E. obesus*. Sides of head, whole body, and vertical fins with round bright blue spots arranged in irregular rows; these spots most distinct on the cheeks and opercles and on the lower parts of the sides.

This species resembles the preceding; but the males may be distinguished at once by the much less development of the fins and by the smaller size. The females of the two species bear more resemblance to each other, but differ in a similar way, though to a less degree.

Length of specimens examined about $2\frac{3}{4}$ inches.

Many specimens in the United States National Museum from the Potomac River, Delaware River and from localities in New Jersey.

The real affinities of *E. margarotis* are probably rather with *E. obesus*, and especially *E. gloriosus*, than with *E. pinniger*.

Bryttus fasciatus Holbrook seems to be identical with *E. obesus*.

I have seen no specimens of *E. gloriosus*, and know it only by Holbrook's description and figure.

The several species have been contrasted in the following table prepared by Dr. Gill and myself:—

- *. Dorsal and anal moderately developed in the male as well as female (extending, when declined backward, little if any beyond the base of the caudal); scales on cheek and opercles not crowded, and forming more or less distinct vertical series:
- t. Body marked with about eight well-defined dark cross-bars; opercular angle with a pretty large black spot, half or more the size of the eye; spots on body and fins purplish, red, or golden; scales large, little crowded; caudal fin moderately elongate, as long as from snout to about the middle of the opercle; lateral line usually incomplete behind OBESUS.
- tt. Body without definite cross-bars or bands; opercular spot smaller, but little larger than pupil; caudal fin short, about as long as from snout to the posterior margin of the preopercle:
- ‡. Spots on body and fins pinkish or golden; dorso-ocular profile moderately convex; interorbital space quite depressed, the protruding snout forming an angle above the eye; body rather short and deep, the depth about half-length; a small black spot at root of caudal GLOBIOSUS.
- ‡‡. Spots on body and fins bright blue; dorso-ocular profile little convex, without decided concavity above orbits; body comparatively elongate, the depth less than half-length; no black caudal spot MARGAROTIS.
- **. Dorsal and anal fins much enlarged in the males (extending when declined backward as far as the middle of the caudal fin), but not in the female; scales on cheeks and opercles crowded together, forming oblique series; caudal fin very long, in the males as long as from the snout to the black opercular spot; in the females somewhat shorter; anal spines less rapidly graduated; body and fins with round pale spots, some or all of which are bright blue; lateral line complete,

PINNIGER.

23. CENTRARCHUS.

Two species, at least, of the genus *Centrarchus* inhabit the waters of the Southern States, which seem to have been named by Lacépède, respectively, *Labrus macropterus* and *Labrus irideus*. *Labrus sparoides* Lacépède is also a *Centrarchus*, either identical with *L. macropterus*, or else it is a species not yet known. It is said to have ten dorsal and ten anal spines. *Centrarchus sparoides* C. & V. is apparently *C. macropterus*.

Centrarchus macropterus is a more elongate species than the common *Centrarchus irideus*. Its mouth is larger, the eye is larger, the fins are much larger, and with longer and more numerous spines. The anal fin in particular is advanced forward, so that the long spine of the ventral fin laps over on the anal as in *Copelandia*.

The most striking differences are shown in the following comparative table of characters :—

| | <i>C. macropterus</i> , (Lac.) For., Ocmulgee River, Ga. | <i>C. irideus</i> , (Lac.) C. & V., Coosa River, Ala., Neuse River, N. C. |
|--------------------------------------|---|---|
| Dorsal rays (usually)..... | XII, 12 | XI, 12. |
| Anal rays (usually)..... | VIII, 14 | VII, 14. |
| Head in length | 3..... | $3\frac{1}{6}$. |
| Depth in length | $2\frac{1}{3}$ | 2. |
| Lateral line | 5-43-12..... | 5-14-14. |
| Ventral spine in head | $1\frac{1}{2}$ | $2\frac{1}{2}$. |
| Ventral spine reaching | 4th anal spine | Not to vent. |
| Longest dorsal spine in head | $1\frac{1}{2}$ | $1\frac{3}{4}$. |
| Longest soft dorsal ray in head..... | $1\frac{1}{2}$ | $1\frac{2}{3}$. |
| Longest soft anal ray in head..... | $1\frac{1}{6}$ | $1\frac{1}{2}$. |
| Mandible..... | More than half head . | Less than half head. |

The coloration in the two species appears to be essentially the same.

GENERA OF CENTRARCHIDÆ.

Prof. Gill now recognizes sixteen genera of *Centrarchidæ*, for which he suggests the following sequence, beginning with the most generalized type, *Micropterus*.

Subfamily MICROPTERINÆ, Gill.

1. *Micropterus*, Lacépède.

Subfamily LEPIOPOMINÆ, Gill.

§ 1.

2. *Chænobryttus*, Gill.

4. *Archoplites*, Gill.

3. *Ambloplites*, Raf.

5. *Acantharchus*, Gill.

§ 2.

6. *Apomotis*, Raf.

9. *Xystroplites*, Jordan.

7. *Lepiopomus*, Raf.

10. *Eupomotis*, Gill & Jordan.

8. *Xenotis*, Jordan.

§ 3.

11. *Mesogonistius*, Gill.

§ 4.

2. *Enneacanthus*, Gill.

14. *Conelandia*, Jordan.

13. *Hemioplites*, Cope.

Subfamily CENTRARCHINÆ, Gill.

15. *Centrarchus*, Cuv. & Val.16. *Pomoxys*, Raf.

The first section of the subfamily of *Lepiopomine* is distinguished by the development of an oval patch of teeth on each entopterygoid bone, as well as a continuation on each pterygoid bone of a band of teeth from the palatine bone, a character not hitherto noticed, to which Prof. Gill has called my attention. The setiform gill-rakers, reminding us of the Cichlid genus *Chaetobranchus*, form an important distinctive character of *Centrarchina*.

ANALYSIS OF THE GENERA OF CENTRARCHIDÆ.

I include here, for the sake of comparison, the aberrant genus *Elasosoma*, whose precise affinities are as yet undetermined:—

A. Lateral line well developed; vomerine teeth present; branchiostegals, 6; fins largely developed, with normally more than five dorsal spines (true *Centrarchide*):

*. Dorsal fin much more developed than anal fin (the base of the former $1\frac{1}{2}$ to 3 times that of the latter), the soft parts of the two fins about equal, of 8 to 14 rays, and ending at the same vertical behind:

†. Body elongate, not greatly compressed; spines little developed, those of the anal fin, three in number, small and weak; those of the dorsal ten, the eighth and ninth quite short, so that there is a deep notch between the spinous and soft parts of the dorsal, almost breaking the continuity of the fin; caudal emarginate; operculum emarginate behind, ending in two flat points; mouth very large, the lower jaw longest; palatine teeth well developed; tongue and pterygoids toothless; gill-rakers long and stout, armed with teeth; supplemental maxillary bone well developed (*Micropterus*) MICROPTERUS, 1.

††. Body comparatively short and deep, compressed; anal spines well developed; dorsal with strong spines, which are continuous with the soft rays, or at least not deeply notched (*Lepiopomine*):

a. Tongue and pterygoid bones conspicuously armed with teeth: mouth large, lower jaw longest; maxillary bone broad and flat, with a strong supplemental ossicle behind it; palatine teeth well developed; gill-rakers long and strong, provided with coarse teeth; form stout and heavy:

b. Operculum emarginate behind; anal spines 5 to 7:

c. Caudal fin emarginate; scales ctenoid:

d. Tongue with two patches of teeth; anal spines normally 7; dorsal 12; gill-rakers longer, and somewhat more numerous than in the next,

ARCHOPLITES, 2.

dd. Tongue with a single median patch of teeth; anal spines normally 6; dorsal 10 or 11..... AMBLOPLITES, 3.

cc. Caudal fin rounded behind; scales cycloid; anal spines normally 5,

ACANTHARCHUS, 4.

bb. Operculum ending behind in a convex "flap", black in color; anal spines 3; dorsal 10; caudal emarginate..... CHÆNOBRYTTUS, 5.

aa. Tongue and pterygoid bones toothless; mouth moderate or small:

d. Operculum ending behind in an entire convex process or flap, which is always more or less black; dorsal fin not notched; dorsal spines normally 10; anal spines 3, the soft rays in each about 10 in number; caudal fin emarginate:

e. Maxillary with a supplemental bone; gill-rakers long, stout, dentate; mouth rather large, the lower jaw protruding; palatine teeth present; spines low; flap small *Apomotis*, 6.

ee. Maxillary without supplemental bone; mouth rather small, with subequal jaws:

f. Lower pharyngeal bones comparatively narrow, with the teeth all conic and sharp, the outer short and small, the inner long and pointed:

g. Gill-rakers of anterior branchial arch more or less elongate, ossified, beset with small teeth (gill-rakers long and slender, beset on one side with minute teeth, no palatine teeth, subgenus *Helioperca*;—or comparatively short and thick, with larger teeth, palatine teeth usually present, subgenus *Lepiopus*) *Lepiopus*, 7.

gg. Gill-rakers undifferentiated, all short, thickish, weak, unossified, provided with but few weak teeth; no palatine teeth; opercular flap always large, often greatly developed; coloration brilliant; spines low *Xenotis*, 8.

ff. Lower pharyngeal bones with the teeth or most of them rounded or truncate above, i. e., teeth paved, palatine teeth little developed, or more usually wanting:

h. Lower pharyngeals narrow, formed as in *Lepiopus*, the teeth rounded, not truncate above; gill-rakers rather long and slender; spines rather high *Xystroplites*, 9.

hh. Lower pharyngeals broad, concave, with large truncate teeth close together; gill-rakers short and thick, more or less strongly dentate; spines high *Eupomotis*, 10.

dd. Operculum emarginate behind, ending in two flat points, with a dermal border; caudal fin rounded behind; gill-rakers in small number, long and strong, dentate; species of small size and brilliant coloration:

h. Dorsal fin angulated, the middle spines longer than some of the posterior ones; supplemental maxillary wanting (? or rudimentary); anal spines 3; dorsal 10 *Mesogonistius*, 11.

hh. Dorsal fin continuous; supplemental maxillary bone well developed:

i. Dorsal spines 9; anal 3 *Enneacanthus*, 12

ii. Dorsal spines 8; anal 4 *Hemiplites*, 13

iii. Dorsal spines 10; anal 4; anal fin with an elongate basis, its anterior rays being advanced *Copelandia*, 14

** Dorsal and anal fins about equal in extent, the soft portions of the latter longest and most posterior, the two fins being obliquely opposed; lower jaw longest; supplemental maxillary bone present; palatine teeth present; operculum emarginate behind; gill-rakers setiform, very long, finely dentate, in large number (20 to 30 of the large ones of anterior branchial arch); fins large, the soft rays of the dorsal and anal each with 14 to 18 rays; caudal fin emarginate; scales not strongly ctenoid (*Centrarchinae*):

j. Spinous dorsal longer than soft part, the spines about 12 in number, not rapidly graduated; anal spines normally 8; body deep; mouth moderate.

..... *Centrarchus*, 15

jj. Spinous dorsal shorter than soft part, the spines 5 to 8 in number, rapidly graduated; anal spines normally 6; body compressed and rather elongate; mouth large *Pomoxys*, 16

AA. No lateral line; no vomerine teeth apparent; fins little developed, the dorsal with 5 spines, the anal with 3; branchiostegals apparently 5; scales cycloid; upper jaw unusually protractile; jaws with strong teeth; size small (*Elassominae*):

- k. Mouth small, oblique, the lower jaw the longer; jaws with apparently one row of stout conical teeth; branchiostegal membranes broadly connected across the pectoral region; body rather elongate, compressed; caudal fin rounded; cheeks and opercles scaly.....ELASSOMA, 17.

CATALOGUE OF SPECIES OF CENTRARCHIDÆ.

I give below a catalogue of the species of *Centrarchidæ*, which appear to be valid, with their geographical distribution. Those of which I have not been able to examine specimens are indicated by a star (*). Several species, as *Lepomis ophthalmicus* Cope, *Bryttus humilis* Grd., are known only from specimens too immature for me at least to come to any certain conclusion as to their true relations.

The type-species of each genus is placed first; *d. s.* indicates doubtful species; *d. g.*, doubt as to whether placed in the proper genus.

MICROPTERUS, *Lacépède*.

1. *Micropterus salmoides*, (Lac.) Gill.—New England and Great Lake Region to Alabama.
2. *Micropterus pallidus*, (Raf.) Gill & Jordan.—Great Lake Region and Red River of the North to Virginia, Florida, and Mexico.

CHÆNOBRYTTUS, *Gill*.

3. *Chænobryttus gnulosus*, (C. & V.) Gill.—Upper Great Lakes, Mississippi Valley, and Southwest.
4. *Chænobryttus viridis*, (C. & V.) Jordan.—Virginia to Florida, east of the Alleghanies.

AMBLOPLITES, *Rafinesque*.

5. *Ambloplites rupestris*, (Raf.) Gill.—Lake Champlain to the Saskatchewan and south to Florida and Texas. (Includes two or three geographical varieties or nascent species.)
6. *Ambloplites cavifrons*, Cope.—Virginia to North Carolina.

ARCHOPLITES, *Gill*.

7. *Archoplites interruptus*, (Grd.) Gill.—Streams of the Pacific Slope.

ACANTHARCHUS, *Gill*.

8. *Acantharchus pomotis*, (Baird) Gill.—New York to South Carolina, coastwise.

APOMOTIS, *Rafinesque*.

9. *Apomotis cyanellus*, Raf.—Entire Mississippi Valley and streams of Texas.
10. *Apomotis *albulus*, (Grd.) Jor., *d. g.*—Texas, &c.
11. *Apomotis signifer*, (Grd.) Jor., *d. s.*—Texas, &c.
12. *Apomotis phenax*, Cope & Jordan.—New Jersey.

LEPIOPOMUS, *Rafinesque*.

13. *Lepiopus auritus*, (L.) Raf.—Maine to Florida—exclusively east of the mountains.
14. *Lepiopus apiatus*, Cope.—Florida.
15. *Lepiopus miniatus*, Jordan.—Louisiana.
16. *Lepiopus elongatus*, (Holbr.) Gill & Jor.—Florida.
17. *Lepiopus *bombifrons*, (Ag.) Jor., *d. g.*—Tennessee River.
18. *Lepiopus obscurus*, (Ag.) Jor.—Georgia, Alabama, Tennessee.
19. *Lepiopus ischyurus*, Jor. & Nelson.—Illinois.
20. *Lepiopus pallidus*, (Mit.) Gill & Jor.—New Jersey to Great Lake Region, Mississippi Valley south to Florida and Texas.
21. *Lepiopus *mystacalis*, Cope.—Florida.
22. *Lepiopus humilis*, (Grd.) Cope.—Texas.
23. *Lepiopus macrochirus*, Raf.—Ohio Valley to Illinois.
24. *Lepiopus anagallinus*, Cope.—Kentucky to Kansas.
25. *Lepiopus oculatus*, Cope.—Upper Mississippi Valley.

XYSTROPLITES, *Jordan*.

26. *Xystroplites gillii*, Jordan.—Florida.
27. *Xystroplites heros*, (B. & G.) Jord.—Texas.
28. *Xystroplites notatus*, (Ag.) Jord.—Tennessee River.

EUPOMOTIS, *Gill & Jordan*.

29. *Eupomotis aureus*, (Walbaum) Gill & Jordan.—Upper Mississippi Valley, Great Lake Region to New England, and south to Florida east of the Alleghanies. Not found in the Mississippi Valley south of Iowa.
30. *Eupomotis speciosus*, (Holbr.) Gill.—Florida.
31. *Eupomotis pallidus*, (Ag.) Gill & Jordan.—Lower Mississippi Valley, Illinois, and south.

XENOTIS, *Jordan*.

32. *Xenotis fallax*, (B. & G.) Jordan.—Texas.
33. *Xenotis breviceps*, (B. & G.) Jordan.—Louisiana to Texas.
34. *Xenotis popii*, (Grd.) Jord., *d. s.*—Texas.
35. *Xenotis megalotis*, (Raf.) Jord.—Ohio Valley and Upper Mississippi Valley.
36. *Xenotis sanguinolentus*, (Ag.) Jord.—South Carolina to Tennessee and Louisiana.
37. *Xenotis lythrochloris*, Jordan.—Ohio Valley.
38. *Xenotis solis*, (Val.) Gill & Jor.—Louisiana.
39. *Xenotis aureolus*, Jordan.—Ohio Valley.
40. *Xenotis aquilensis*, (B. & G.) Jor., *d. g.*—Texas.
41. *Xenotis* **marginatus*, (Holbr.) Jor., *d. g.*—Florida.
42. *Xenotis peltastes*, (Cope) Jor.—Michigan to Illinois.
43. *Xenotis inscriptus*, (Ag.) Jor.—Ohio to Missouri and south.
44. *Xenotis ophthalmicus*, (Cope) Jor., *d. s.*, *d. g.*—Roanoke River.

MESOGONISTIUS, *Gill*.

45. *Mesogonistius chætodon*, (Baird) Gill.—New Jersey to Maryland.

ENNEACANTHUS, *Gill*.

46. *Enneacanthus obesus*, (Grd.) Gill.—Massachusetts to North Carolina.
47. *Enneacanthus margarotis*, Gill & Jordan.—New Jersey to Virginia.
48. *Enneacanthus pinniger*, Gill & Jor.—North Carolina.
49. *Enneacanthus* **gloriosus*, (Holbr.) Jordan.—Florida.
50. *Enneacanthus* **milnerianus*, Cope.—Florida.

HEMIOPLITES, *Cope*.

51. *Hemioplites simulans*, Cope.—Virginia.

COPELANDIA, *Jordan*.

52. *Copelandia eriarcha*, Jordan.—Wisconsin.

CENTRARCHUS, *Cuvier & Valenciennes*.

53. *Centrarchus irideus*, (Lacépède) C. & V.—North Carolina to Illinois and south, in lowland streams.
54. *Centrarchus macropterus*, (Lac.) Jor.—South Carolina to Alabama.

POMOXYS, *Rafinesque*.§ *Pomoxys*.

55. *Pomoxys annularis*, Raf.—Entire Mississippi Valley south of Wisconsin and Ohio.

§ *Hyperistius*.

56. *Pomoxys nigromaculatus*, (Le S.) Girard.—Mississippi Valley, Great Lake Region, and streams of the Atlantic States from New Jersey to Florida.

LIST OF NOMINAL SPECIES OF CENTRARCHIDÆ, WITH IDENTIFICATIONS.

I give a list, in chronological order, of the species of *Centrarchidæ* hitherto described, so far as known to me, with my identification of them. Those species of which I have examined the original type are designated by a dagger (†).

| Nominal species. | Date. | Identification. |
|--|-------|-------------------------------------|
| <i>Labrus auritus</i> , Linné..... | 1758 | <i>Lepiopomus auritus</i> . |
| <i>Sparus aureus</i> , Walbaum..... | 1792 | <i>Eupomotis aureus</i> . |
| <i>Labrus macropterus</i> , Lacépède..... | 1802 | <i>Centrarchus macropterus</i> . |
| <i>Labrus sparoides</i> , Lac..... | 1802 | <i>Centrarchus macropterus</i> (†). |
| <i>Labrus salmoides</i> , Lac..... | 1802 | <i>Micropterus salmoides</i> . |
| <i>Labrus irideus</i> , Lac..... | 1802 | <i>Centrarchus irideus</i> . |
| <i>Micropterus dolomieu</i> , Lac..... | 1802 | <i>Micropterus salmoides</i> . |
| <i>Morone maculata</i> , Mit..... | 1814 | <i>Eupomotis aureus</i> . |
| <i>Sparus mocasinus</i> , Raf..... | 1814 | <i>Eupomotis aureus</i> . |
| <i>Labrus palladus</i> , Mit..... | 1814 | <i>Lepiopomus pallidus</i> . |
| <i>Bodianus achigan</i> , Raf..... | 1817 | <i>Micropterus salmoides</i> . |
| <i>Bodianus rupestris</i> , Raf..... | 1817 | <i>Ambloplites rupestris</i> . |
| <i>Sparus erythroptus</i> , Raf..... | 1818 | (Erroneous.) |
| <i>Labrus appendix</i> , Mit..... | 1818 | <i>Lepiopomus pallidus</i> . |
| <i>Pomoxis annularis</i> , Raf..... | 1818 | <i>Pomoxys annularis</i> . |
| <i>Calliurus punctulatus</i> , Raf..... | 1819 | <i>Micropterus salmoides</i> . |
| <i>Lepomis cyanellus</i> , Raf..... | 1819 | <i>Apomotis cyanellus</i> . |
| <i>Lepomis macrochirus</i> , Raf..... | 1819 | <i>Lepiopomus macrochirus</i> . |
| <i>Icthelis melanops</i> , Raf..... | 1820 | <i>Apomotis cyanellus</i> . |
| <i>Icthelis erythroptus</i> , Raf..... | 1820 | <i>Ambloplites rupestris</i> . |
| <i>Icthelis aurita</i> , Raf. (not of 1819)..... | 1820 | <i>Xenotis lythrochloris</i> . |
| <i>Icthelis megalotis</i> , Raf..... | 1820 | <i>Xenotis megalotis</i> . |
| <i>Lepomis pallida</i> , Raf..... | 1820 | <i>Micropterus pallidus</i> . |
| <i>Lepomis trifasciata</i> , Raf..... | 1820 | <i>Micropterus salmoides</i> . |
| <i>Lepomis flexuolaris</i> , Raf..... | 1820 | <i>Micropterus salmoides</i> . |
| <i>Lepomis salmonea</i> , Raf..... | 1820 | <i>Micropterus salmoides</i> . |

| Nominal species. | Date. | Identification. |
|---|-------|---|
| <i>Lepomis notata</i> , Raf..... | 1820 | <i>Micropterus salmoides</i> . |
| <i>Lepomis ichtheloides</i> , Raf..... | 1820 | <i>Ambloplites rupestris</i> . |
| <i>Etheostoma calliura</i> , Raf..... | 1820 | <i>Micropterus salmoides</i> . |
| <i>Cichla aenea</i> , Le Sueur..... | 1822 | <i>Ambloplites rupestris</i> . |
| <i>Cichla fasciata</i> , Le S..... | 1822 | <i>Micropterus salmoides</i> . |
| <i>Cichla ohioensis</i> , Le S..... | 1822 | <i>Micropterus salmoides</i> . |
| <i>Cichla floridana</i> , Le S..... | 1822 | <i>Micropterus pallidus</i> . |
| <i>Cichla minima</i> , Le S..... | 1822 | <i>Micropterus salmoides</i> . |
| <i>Huro nigricans</i> , C. & V..... | 1828 | <i>Micropterus pallidus</i> . |
| <i>Centrarchus pentacanthus</i> , C. & V..... | 1829 | <i>Ambloplites rupestris</i> . |
| <i>Cantharus nigromaculatus</i> , Le Sueur..... | 1829 | <i>Pomoxys nigromaculatus</i> . |
| <i>Pomotis vulgaris</i> , C. & V..... | 1829 | <i>Eupomotis aureus</i> . |
| <i>Pomotis gulosus</i> , C. & V..... | 1829 | <i>Chaenobryttus gulosus</i> . |
| <i>Centrarchus hexacanthus</i> , C. & V..... | 1831 | <i>Pomoxys nigromaculatus</i> . |
| <i>Centrarchus viridis</i> , C. & V..... | 1831 | <i>Chaenobryttus viridis</i> . |
| <i>Bryttus punctatus</i> , C. & V..... | 1831 | <i>Apomotis cyanellus</i> . |
| <i>Bryttus reticulatus</i> , C. & V..... | 1831 | <i>Chaenobryttus viridis</i> . |
| <i>Bryttus unicolor</i> , C. & V..... | 1831 | (?) |
| <i>Pomotis ravenelii</i> , C. & V..... | 1831 | <i>Eupomotis aureus</i> . |
| <i>Pomotis holbrookii</i> , C. & V..... | 1831 | <i>Eupomotis aureus</i> . |
| <i>Pomotis incisor</i> , C. & V..... | 1831 | <i>Lepiopomus pallidus</i> . |
| <i>Pomotis gibbosus</i> , C. & V..... | 1831 | <i>Lepiopomus pallidus</i> . |
| <i>Pomotis solis</i> , C. & V..... | 1831 | <i>Xenotis solis</i> . |
| <i>Pomotis catesbeii</i> , C. & V..... | 1831 | <i>Eupomotis aureus</i> . |
| <i>Cichla storeria</i> , Kirt..... | 1838 | <i>Pomoxys annularis</i> . |
| <i>Pomotis nitida</i> , Kirt..... | 1841 | <i>Xenotis megalotis</i> . |
| <i>Centrarchus obscurus</i> , De Kay..... | 1842 | <i>Micropterus salmoides</i> . |
| <i>Pomotis rubricauda</i> , Storer..... | 1842 | <i>Lepiopomus auritus</i> . |
| <i>Pomotis aquilensis</i> , B. & G. †..... | 1853 | <i>Xenotis</i> (?) <i>aquilensis</i> . |
| <i>Pomotis breviceps</i> , B. & G. †..... | 1853 | <i>Xenotis breviceps</i> . |
| <i>Pomotis longulus</i> , B. & G. †..... | 1853 | <i>Apomotis cyanellus</i> . |
| <i>Grystes nobilis</i> , Ag..... | 1854 | <i>Micropterus pallidus</i> . |
| <i>Pomotis sanguinolentus</i> , Ag..... | 1854 | <i>Xenotis sanguinolentus</i> . |
| <i>Pomotis inscriptus</i> , Ag..... | 1854 | <i>Xenotis inscriptus</i> . |
| <i>Pomotis notatus</i> , Ag..... | 1854 | <i>Xystroplites</i> (?) <i>notatus</i> . |
| <i>Pomotis obscurus</i> , Ag..... | 1854 | <i>Lepiopomus obscurus</i> . |
| <i>Pomotis bombifrons</i> , Ag..... | 1854 | <i>Lepiopomus</i> (?) <i>bombifrons</i> . |
| <i>Pomotis pallidus</i> , Ag..... | 1854 | <i>Eupomotis pallidus</i> . |
| <i>Pomotis speciosus</i> , B. & G. †..... | 1854 | <i>Lepiopomus pallidus</i> (var.?). |
| <i>Pomotis fallax</i> , B. & G. †..... | 1854 | <i>Xenotis fallax</i> . |
| <i>Pomotis convexifrons</i> , B. & G. †..... | 1854 | <i>Xenotis fallax</i> . |
| <i>Pomotis nefastus</i> , B. & G..... | 1854 | <i>Xenotis</i> (?) <i>aquilensis</i> . |
| <i>Pomotis heros</i> , B. & G. †..... | 1854 | <i>Xystroplites heros</i> . |

| Nominal species. | Date. | Identification. |
|---|-------|--------------------------------------|
| <i>Grystes nuceensis</i> , B. & G† | 1854 | <i>Micropterus pallidus</i> . |
| <i>Centrarchus interruptus</i> , Grd. † | 1854 | <i>Archoplites interruptus</i> . |
| <i>Centrarchus maculosus</i> , Ayres | 1854 | <i>Archoplites interruptus</i> . |
| <i>Pomotis obesus</i> , Grd. † | 1854 | <i>Euneacanthus obesus</i> . |
| <i>Pomotis elongatus</i> , Holbr | 1855 | <i>Lepiopomus elongatus</i> . |
| <i>Pomotis speciosus</i> , Holbr | 1855 | <i>Eupomotis speciosus</i> . |
| <i>Pomotis marginatus</i> , Holbr | 1855 | <i>Xenotis marginatus</i> . |
| <i>Bryttus fasciatus</i> , Holbr | 1855 | <i>Euneacanthus obesus</i> . |
| <i>Bryttus gloriosus</i> , Holbr | 1855 | <i>Euneacanthus gloriosus</i> . |
| <i>Calliurus floridensis</i> , Holbr | 1855 | <i>Chænobryttus viridis</i> . |
| <i>Pomotis chætodon</i> , Baird † | 1855 | <i>Mesogonistius chætodon</i> . |
| <i>Centrarchus pomotis</i> , Baird | 1855 | <i>Acantharchus pomotis</i> . |
| <i>Grystes megastoma</i> , Garlick | 1857 | <i>Micropterus pallidus</i> . |
| <i>Pomoxys nitidus</i> , Grd. † | 1857 | <i>Pomoxys annularis</i> . |
| <i>Calliurus melauops</i> , Grd. † | 1857 | <i>Chænobryttus gulosus</i> . |
| <i>Calliurus diaphanus</i> , Grd | 1857 | <i>Apomotis cyanellus</i> . |
| <i>Calliurus formosus</i> , Grd. † | 1857 | <i>Apomotis cyanellus</i> . |
| <i>Calliurus microps</i> , Grd. † | 1857 | <i>Apomotis cyanellus</i> . |
| <i>Calliurus murinus</i> , Grd. † | 1857 | <i>Apomotis cyanellus</i> . |
| <i>Bryttus albulus</i> , Grd | 1857 | <i>Apomotis</i> (?) <i>albulus</i> . |
| <i>Bryttus signifer</i> , Grd. † | 1857 | <i>Apomotis signifer</i> . |
| <i>Bryttus humilis</i> , Grd. † | 1857 | <i>Lepiopomus humilis</i> . |
| <i>Pomotis luna</i> , Grd | 1857 | <i>Lepiopomus pallidus</i> . |
| <i>Pomotis popei</i> , Grd. † | 1858 | <i>Xenotis popii</i> . |
| <i>Pomotis guttatus</i> , Morris | 1859 | <i>Euneacanthus obesus</i> . |
| <i>Pomotis microlophus</i> , Gthr | 1859 | <i>Eupomotis speciosus</i> . |
| <i>Hyperistius carolinensis</i> , Gill | 1864 | <i>Pomoxys nigromaculatus</i> . |
| <i>Pomoxys brevicanda</i> , Gill † | 1865 | <i>Pomoxys annularis</i> . |
| <i>Pomoxys intermedius</i> , Gill | 1865 | <i>Pomoxys annularis</i> . |
| <i>Pomoxys protacanthus</i> , Gill | 1865 | <i>Pomoxys annularis</i> . |
| <i>Bryttus ocellatus</i> , Cope † | 1865 | <i>Lepiopomus ocellatus</i> . |
| <i>Lepomis longispinis</i> , Cope † | 1865 | <i>Lepiopomus pallidus</i> (var. ?). |
| <i>Bryttus mineopas</i> , Cope † | 1865 | <i>Apomotis cyanellus</i> . |
| <i>Ambloplites cavifrons</i> , Cope † | 1869 | <i>Ambloplites cavifrons</i> . |
| <i>Hemioplites simulans</i> , Cope † | 1869 | <i>Hemioplites simulans</i> . |
| <i>Lepomis anagallinus</i> , Cope † | 1869 | <i>Lepiopomus anagallinus</i> . |
| <i>Lepomis ardesiacus</i> , Cope † | 1869 | <i>Lepiopomus pallidus</i> (juv.). |
| <i>Lepomis ophthalmicus</i> , Cope † | 1869 | <i>Xenotis</i> sp. ? (juv.). |
| <i>Lepomis gillii</i> , Cope † | 1869 | <i>Chænobryttus viridis</i> . |
| <i>Lepomis charybdis</i> , Cope | 1869 | <i>Chænobryttus gulosus</i> . |
| <i>Lepomis nephelus</i> , Cope † | 1869 | <i>Lepiopomus macrochirus</i> . |
| <i>Lepomis purpurascens</i> , Cope † | 1870 | <i>Lepiopomus pallidus</i> (var. ?). |
| <i>Lepomis peltastes</i> , Cope * | 1870 | <i>Xenotis peltastes</i> . |

| Nominal species. | Date. | Identification. |
|--|-------|-----------------------------------|
| <i>Dioplites treculii</i> , Le Vaillant & Bocourt. | 1874 | <i>Micropterus pallidus</i> (?). |
| <i>Dioplites variabilis</i> , (Le S.) Le V. & Boc... | 1874 | <i>Micropterus pallidus</i> (?). |
| <i>Copelandia erjarcha</i> , Jor. † | 1876 | <i>Copelandia eriarcha</i> . |
| <i>Xenotis lythrochloris</i> , Jor. † | 1877 | <i>Xenotis lythrochloris</i> . |
| <i>Xenotis aureolus</i> , Jor. † | 1877 | <i>Xenotis aureolus</i> . |
| <i>Xystroplites gillii</i> , Jor. † | 1877 | <i>Xystroplites gillii</i> . |
| <i>Lepiopomus ischyryus</i> , Jor. & Nels. † | 1877 | <i>Lepiopomus ischyryus</i> . |
| <i>Apomotis phenax</i> , Cope. & Jor. † | 1877 | <i>Apomotis phenax</i> . |
| <i>Lepiopomus miniatus</i> , Jor. † | 1877 | <i>Lepiopomus miniatus</i> . |
| <i>Enneacanthus pinniger</i> , Gill & Jor. † | 1877 | <i>Enneacanthus pinniger</i> . |
| <i>Enneacanthus margarotis</i> , Gill & Jor.... | 1877 | <i>Enneacanthus margarotis</i> . |
| <i>Enneacanthus milnerianus</i> , Cope, MSS.... | 1877 | <i>Enneacanthus milnerianus</i> . |
| <i>Lepomis apiatus</i> , Cope, MSS..... | 1877 | <i>Lepiopomus apiatus</i> . |
| <i>Lepomis mystacalis</i> , Cope, MSS..... | 1877 | <i>Lepiopomus mystacalis</i> . |
| <i>Xystroplites longimannus</i> , Cope, MSS..... | 1877 | <i>Eupomotis speciosus</i> (?). |

24. XENOTIS LYTHROCHLORIS.

Iethelis aurita, RAF., Ichthyologia ohioensis, 1820 (not *Labrus auritus* Linn.; not *Lepomis auritus* Raf., 1819).

Lepomis auritus, COPE, Journ. Acad. Nat. Sci. Phila. 1868 (not *Lepomis auritus* Gill).
Ichthelis sanguinolentus, JORDAN, Man. Vert. 1876 (in part, confounded with *X. megalotis* and *X. sanguinolentus*.)

Xenotis lythrochloris, JORDAN (1877), Bull. U. S. Nat. Mus. ix, —.

This elegant species is fairly described by Rafinesque, and quite accurately by Prof. Cope, but no other writers seem to have distinguished it. It does not seem best to retain the name *auritus*. Rafinesque apparently took this species for the Linnean *auritus*, and, if so, this is simply a case of mistaken identification, and the name thus given in error should not be retained. If we suppose that Rafinesque intended to describe his *aurita* as a new species, we have the anomalous case of an author describing a new species under the specific name borne by an old species which he himself elsewhere precisely indicates as the type of his genus. In this view, which would be absurd in regard to any author other than Rafinesque, we should have two species, strongly resembling each other, in closely related genera, both bearing the same specific name, *Lepiopomus auritus* and *Xenotis auritus*. This undesirable arrangement we can avoid by supposing, what is probably the fact, that Rafinesque wrongly identified his *Iethelis aurita* with *Labrus auritus* of Linnæus. Rafinesque's *aurita* being thus without a specific name,

I supply that of *lythrochloris*, in allusion to the blood-red and pale-green coloration.

Xenotis lythrochloris needs comparison chiefly with *X. megalotis*. The body is elongate proportionally, somewhat as in the species of *Apomotis*, but the profile is quite steep. The back along the base of the dorsal fin is unusually straight, not strongly bowed as in *megalotis*. The colors are different in life; there is more red on the cheeks and fins in *X. lythrochloris*, but the ground-color of the back is a decided olive-green with blue spots. The belly, as in *megalotis*, is orange. The membrane of the soft parts of the vertical fins in *X. lythrochloris* is bright orange-red. The spines are extremely short, the longest about equal to length of snout. The most available distinctive point is in the opercular flap, which is extremely long, longer than in *megalotis* or *sanguinolentus*, and entirely black, without any trace of pale edging whatever, except at base. In *megalotis*, the flap is conspicuously edged with paler.

X. megalotis abounds most in ponds and still deep places in the rivers. *X. lythrochloris* runs up the small brooks into places where it and *Apomotis cyanellus* are the only Centrarchine inhabitants, whence it often comes to adorn the urchin's string in company with *Semotilus corporalis*, *Catostomus teres*, *Camptostoma anomala*, and other "boys' fish".

25. XENOTIS AUREOLUS, Jordan.

? *Pomotis macrochira*, KIRTLAND (1833), Bost. Journ. Nat. Hist. iii, 469.—STORER (1846), Synopsis, 298 (not *Icthelis macrochira* Raf.=*Lepomis nephelus* Cope).

Icthelis macrochira, JORDAN (1876), Bull. Buff. Nat. Hist. Soc. 92; Manual Vert. 236 (not of Raf.).

Xenotis aureolus, JORDAN (1877), Bull. ix, U. S. Nat. Mus. —

Body oblong, rather heavy forward; the forehead usually quite convex, but sometimes the profile straightish or almost concave; depth about $2\frac{1}{2}$ in length; head $2\frac{2}{3}$; eye about as large as flap in adult, 4 in head; mouth moderate; scales on cheeks rather large, in 5 or 6 rows.

Fin-rays as in related species; dorsal spines short, rather longer than in *X. lythrochloris*, but scarcely longer than snout; pectorals moderate; ventrals elongate.

Colors very clear and translucent, the young almost transparent, the adult lustrous, clear pale green above; sides with much spotting of golden orange or brassy, the spots numerous but not well defined, shading into the green; the orange predominating below; the belly clear orange; some blue spotting on sides, a purplish-red lustre on the sides in life, peculiar to this species. This disappears at death.

Soft parts of vertical fins, particularly the anal, with the membrane, clear orange; ventral fins bluish; cheeks with three broad bronze-orange bands, between which are bands of bluish-green; two bronze bands in front of eye; space beneath eye largely blue-green and iridescent.

Opercular flap not long, narrow, varying to rather wide, with a conspicuous purple margin; iris red; pupil black.

Size small. I have seen none over four inches in length.

Habitat—Ohio Valley; rather common in bayous and still places in small creeks. It occurs in company with *Xenotis lythrochloris*, and, like that species, is commonly among the treasures of the small boy as he comes back from the swimming-hole.

This species much resembles the young of *X. megalotis*, the only species with which it need be compared. *X. megalotis* is more positively and brilliantly colored; there is more blue; the spines are lower, and the scales on the cheeks smaller. *X. aureolus* is chiefly of a golden orange, and in life has a translucency of hue unlike the colors of any other species. In spirits, it becomes of a pale yellowish or white. It is probable that Kirtland's description of *Pomotis macrochira* was drawn up from a specimen of this species. It is certain, however, that Kirtland confounded two or three species under the name of *macrochira*, among them probably *Lepiopomus pallidus*. This cannot well be the species called *macrochira* by Rafinesque. I have therefore proposed the new name of *aureolus*, in allusion to its gilded coloration.

26. XENOTIS INSCRIPTUS, (*Agassiz*) *Jor.*

Pomotis inscriptus, AGASSIZ (1854), Amer. Journ. Sci. Arts, 302.

Lepomis inscriptus, COPE (1869), Journ. Acad. Nat. Sci. Phila. —.

Ichthelis inscriptus, JORDAN (1876), Mammal Vert. 237.

Xenotis inscriptus, JORDAN (1876), Ann. N. Y. Lyc. Nat. Hist. —.

Body oblong, little elevated, the depth $2\frac{1}{2}$ in length; profile and dorsal outline forming a nearly uniform curve from snout to caudal peduncle; eye large, larger than in *megalotis*; mouth moderate; cheek-scales large.

Pectoral fins short, not reaching anal; dorsal spines low, but high for this genus, more developed than in any of the other species, the longest about as long as from snout to middle of pupil; ventral fins not reaching anal.

A small compact handsome species of a dark color, not at all translucent; color dark olive-green, with blue shades; cheeks with blue

lines; opercular flap pretty long, rather narrow, its lower margin being shorter than the upper, directed more obliquely upward than in the other species, bordered above and below with pinkish, many of the scales of the back and sides marked with a short horizontal black line like a pencil-mark, these usually forming interrupted lines along the rows of scales. These markings are often obsolete. Fins dark olive, only the anal usually with red; no black dorsal spot.

Length of specimens examined about 4 to 5 inches.

Habitat.—Tennessee River (Agassiz, Cope); Etowah River (Jordan); White River, Indiana (Jordan); Mississippi River at Cairo (Jordan).

This species may be known to be a *Xenotis* by the ear-flap and the weak gill-rakers. From the other Ohio species, its longer spines, dark green coloration, and the peculiar upward direction of the opercular flap distinguish it. The black streaks which suggested the name *inscriptus* usually disappear with death.

27. LEPIOPOMUS PALLIDUS, (Mitchill) Gill & Jordan.

Labrus pallidus, MITCHILL, 1814, = *Labrus appendix*, MITCHILL, 1818, = *Pomotis incisor*, CUV. & VAL., 1831.

We have here restored the oldest and therefore correct specific name to this species. The genus *Helioperca*, recently proposed by me for this species and its immediate relatives, does not seem sufficiently distinct from *Lepiopomus*. I therefore abandon it, for the present, at least.

28. MICROPTERUS PALLIDUS, (Rafinesque) Gill & Jordan.

Lepomis pallida, RAFINESQUE, 1820, = *Cichla floridana*, LE SUEUR, 1822, = *Huro nigricans*, C. & V., 1828.

Rafinesque's description of his *Lepomis pallida* seems to have been drawn from this species. His specific name should therefore be adopted. This change is especially desirable, as it does away with the objectionable local name *floridanus* for this widely distributed species.

PERCIDÆ.

29. STIZOSTETHIUM, Rafinesque.

The American species of this genus have been involved in considerable confusion, and no one seems to know positively whether we have

two, three, four, or five species, or how those species may be distinguished from each other, or, finally, what names any of them should bear. Having lately been enabled to examine a large number of specimens in a fresh state, through the kindness of John C. Klippart, the efficient fish commissioner of the State of Ohio, I have come to certain provisional conclusions, which I have thought it advisable to insert here.

Among the species of *Stizostethium*, there are two well-marked groups, known to our lake fishermen respectively as the "Saugers" and the "Pikes". These differ somewhat in external peculiarities of form and coloration, and strongly in the arrangement of the pyloric cæca.

In the "Pike" group, there are three pyloric cæca, long and large, subequal, and all longer than the stomach. In the "Saugers", the pyloric cæca are much shorter and smaller. There are four larger than the rest, not quite equal, and all shorter than the stomach. Besides the four larger ones, there are one, two, or three small ones. The total number is usually six, but sometimes the small ones are obsolete.

In the extreme generic subdivision which at present obtains, any such decided anatomical peculiarity may be held to indicate generic distinction. I therefore propose to consider the "Saugers" as at least subgenerically distinct from the "Pikes".

The name *Stizostedion* was proposed by Rafinesque for his *Perca salmonæ*, the "White Salmon of the Ohio". Rafinesque's description is not altogether satisfactory; but, as a certain fish of this genus is still known as the "White Salmon," at the Falls of the Ohio, it is possible to make an undoubted identification. The *Perca salmonæ* is a "Pike", and therefore the name *Stizostedion* (or rather *Stizostethium*, for the name is stated to mean "pungent throat") should be retained for the Pikes.

Since the preceding paragraphs were in type, Prof. Gill and the writer have been enabled to compare the American species of *Stizostethium* with the two inhabiting the waters of Europe, viz, *Stizostethium lucioperca* (L.) G. & J. (*Lucioperca sandra* C. & V.) and *Stizostethium volgense* (Pallas) G. & J. The genus divides at once into four strongly marked sections or subgenera, of which two—that typified by *S. canadense* and that by *S. volgense*—bear little resemblance to each other, and could be readily considered as generically distinct were not the other two sections intermediate. (1) The section typified by *S. volgense* in several respects approaches the genus *Perca*: it may be termed *Mimoperca* (G. & J.). (2) The Sauger group, from the development of the canine teeth, may be appropriately designated as *Cynoperca* (G. & J.).

(3) The American Pike-perch group was called *Stizostethium* by Rafinesque, and (4) the Sandres of Europe were called nearly simultaneously *Lucioperca* by Cuvier and *Sandrus* by Stark. The *Lucioperca marina* Cuv. & Val. (*Perca labrax* Pallas), if correctly described, has apparently no affinity with the genus.

The following analysis of the characters of these groups has been compiled by Prof. Gill and myself after a rigorous comparison of the several forms. It may be stated that we have been unable to ascertain certainly the character of the pyloric cæca in *Mimoperca* and *Lucioperca*, the two specimens of each species in the National Museum being deprived of their intestines:—

- *. Dorsal fins well separated, the interspace between them more than the diameter of the eye; the distance from the base of the last spine of the first dorsal and the first of the second equal to the space occupied by the last 4 to 6 spines of the first dorsal; anal fin II, 12, longer than high; second dorsal I, 17, to I, 21; spines of the second dorsal and anal closely attached to the soft rays; last dorsal spine scarcely erectile, more or less firmly bound down by the membrane; canine teeth strong (American species):
 - t. Soft dorsal comparatively short (its base one-fourth shorter than that of spinous dorsal) and with about 17 short rays; cheeks, opercles, and top of head more or less closely scaled; body depressed, subterete; size small; pyloric cæca forming two groups, the primary one of four, unequal, moderate, much shorter than the stomach; the secondary of few (1-3) rudimentary ones, which are sometimes atrophied CYNOPERCA.
 - ††. Soft dorsal rather long (one-sixth shorter than spinous dorsal), with about 20 soft rays; cheeks and upper surface of head nearly naked; body more compressed; size large; pyloric cæca three, subequal, all long (about as long as stomach), STIZOSTETHIUM.
- **.. Dorsal fins approximated, connected by low membrane, the interspace much less than the diameter of the eye; the distance between the last spine of the first and the first spine of the second only equalling the base covered by the last four or fewer rays of the spinous dorsal; spines of second dorsal and anal connected with succeeding rays by loose membrane; last dorsal spine erectile; second dorsal usually I, 22 or 23; anal fin at least as high as long; body compressed; size large (European species, the body more or less distinctly transversely barred and the first dorsal with series of roundish black spots):
 - †. Soft dorsal considerably (one-fifth) shorter than spinous dorsal; anal fin II, 12, as long as high; canine teeth strong; "pyloric cæca 4 to 6" LUCIOPERCA.
 - ††. Soft dorsal somewhat longer than spinous dorsal; anal fin short and high; its length two-thirds its height; its rays II, 10; canine teeth weak, not much differentiated; body strongly compressed as in the genus *Perca*; "pyloric cæca three" (Günther) MIMOPERCA.

Of American species I know certainly three, the Wall-eyed Pike or Yellow Pike (*Stizostethium vitreum*), the Blue Pike or White Salmon (*Stizostethium salmoneum*), and the Sauger or Gray Pike (*Stizostethium griseum* or *canadense*). The "Sauger" of the Saint Lawrence, *S. canadense*, may be distinct from *S. griseum*, but at present I think it is not;

and, finally, the "Blue Pike" is possibly, but improbably, distinct from the "White Salmon".

Without further discussion, I will give the synonymy and characters of the species now recognized.

30. STIZOSTETHIUM VITREUM (*Mitchill*) *Jordan & Copeland*.

Wall-eyed Pike—Glass Eye—"Dory"—"Salmon"—Pike-perch—Doré—Okow—Horn Fish—Green Pike—Yellow Pike (? female).

Perca vitrea, MITCHILL (1818), Supplement Am. Monthly Mag. ii, 247 (Cayuga Lake).

Stizostedium vitreum, JORDAN & COPELAND (1876), Check List N. Am. Fresh Water Fishes, Bull. Buff. Soc. Nat. Hist. 136.

Stizostethium vitreum, JORDAN (1877), ANN. N. Y. Lyc. Nat. Hist.—JORDAN (1877), in Klippart's Rept. Fish Commr. Ohio.

Lucioperca americana, CUV. & VAL. (1829), ii, 122.—RICHARDSON (1836), Fauna Bor.-Am. iii, 10.—KIRTLAND (1838), Zool. Ohio, 192; Bost. Journ. Nat. Hist. iv 237.—THOMPSON (1842), History Vt. 130.—DE KAY (1842), Zool. N. Y. Fishes, 17.—STORER (1846), Synopsis, 276.—AGASSIZ (1850), Lake Superior, 294.—JARDINE (1852), Nat. Libr. Perches, 107.—GÜNTHER (1859), Cat. Fishes, i, 74.—JORDAN (1874), Ind. Geol. Survey, 212; and of writers generally.

Stizostedium americanum, COPE (1865), Proc. Acad. Nat. Sci. Phila. 82, 85.—COPE (1870), Proc. Am. Philos. Soc. 448.—MILNER (1872-3), Rept. U. S. Fish Comm. 425.—JORDAN (1876), Man. Vert. 225.—UHLER & LUGGER (1876), Fishes of Maryland, 110.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 36.

Body elongate, rather slender and subcylindric, becoming deep with age; the depth in young of 14 inches, $4\frac{1}{2}$ to 5 in length; head long, $3\frac{2}{3}$ in length. Mouth large, the maxillary reaching beyond the pupil to posterior margin of orbit; its length $2\frac{3}{4}$ to 3 in head. Mandible a little more than half length of head; eyes large, less than in *salmonium*, shorter than snout and than preopercle, $4\frac{1}{2}$ to 5 in head. Jaws equal, or the lower slightly projecting, its sides somewhat included. Checks scaly, varying to nearly smooth, usually a few scales at least behind the eye. Opercle with a strong flat spine, which is sometimes bifid or trifid; no smaller ones below it. Dorsal spines high, more than half the length of head, as long as from snout past eye and $\frac{1}{3}$ to $\frac{1}{5}$ past opercle.

General color a heavy olive, varying considerably, finely mottled with brassy, the latter color forming indistinct lines, which run obliquely upward and backward along the rows of scales. Sides of head more or less vermiculated; lower jaw flesh-colored; belly and lower fins pinkish.

Spinous dorsal fin without black spots except a large jet-black blotch, which involves the membrane of the last two or three spines. Second

dorsal and caudal mottled olive and yellowish. Base of pectorals without distinct black spot.

Fin-rays:—Dorsal XII or XIII—1, 20 or 21. Anal II, 12. Lateral line with about 90 scales. Pyloric cæca long and large, subequal, three in number.

Size very large; this species reaches a length of nearly three feet and a weight of twenty or thirty pounds.

Habitat.—Upper Mississippi River, Great Lake Region and streams of the Atlantic slope, south of New England, north to the Fur Countries.

31. STIZOSTETHIUM SALMONEUM, *Rafinesque*.

Blue Pike (Lake Erie)—White Salmon (Ohio River).

Perca salmonea, RAF. (1818), Am. Monthly Mag. v, 354; (1820), Ich. Oh. 21.

Stizostedion salmoneum, RAF. (1820), Ich. Oh. 23.

Stizostedium salmoneum, COPE (1865), Proc. Acad. Nat. Sci. Phila. 82.—JORDAN (1876), Man. Vert. 225.—COPE (1870), Proc. Am. Philos. Soc. 449.—JORDAN & COPELAND (1876), Check List, 136.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 36.

Stizostethium salmoneum, JORDAN (1877), Ann. N. Y. Lyc. Nat. Hist. —; (1877), in Klippart's Rept. Fish Commrs. Ohio, —.

?? *Perca nigropunctata*, RAF. (1820), Ich. Oh. 23 (very erroneous).

?? *Pomacampsis nigropunctatus*, RAF. (1820), Ich. Oh. 23.

This species is very similar to the preceding in its technical characters, and it may prove to be merely a variety. The body is shorter, thicker, and deeper, with slenderer caudal peduncle, the diameter of which is not much greater than that of the large eye. The mouth is smaller, the maxillary not reaching quite to the posterior margin of the pupil, 3 in head; the eye is larger, its diameter equal to the length of the snout or that of the preopercle; the lower jaw is slightly included.

The dorsal spines are evidently considerably lower than in *S. vitreum*, the longest about equal to the distance from the snout to a point just short of hinder margin of orbit, about $2\frac{1}{3}$ in head.

The coloration is similar to that of *S. vitreum*, but the adult is bluer or greener, with scarcely any of the brassiness characteristic of the latter species. The coloration of the fins is darker, and there are traces of a blackish horizontal band along the dorsal in addition to the large black blotch on the hinder rays. Young specimens (from Ohio River) are more silvery, with traces of faint black bars along the back.

Fin-rays:—Dorsal XIV—1, 20. Anal II, 13. Lateral line with 95 scales. Opercular spine single, as in *S. vitreum*. Cheeks largely naked. Pyloric cæca three, large, longer than stomach, as in the preceding species.

Size much less than that of *S. vitreum*. The largest specimens seen by me were about fourteen inches in length. The accompanying figure represents the stomach and pyloric cæca of one of these.

Habitat.—Lake Erie, Ohio River, and southward to Georgia.

32. STIZOSTETHIUM (CYNOPERCA) CANADENSE, (C. H. Smith)
Jordan.

Sauger—Gray Pike—Sand Pike.

? *Lucioperca canadensis*, C. H. SMITH, MSS. (1834).—GRIFFITH'S Cuvier's Animal Kingdom, x, 275.—RICHARDSON (1836), Fauna Bor.-Am. Fishes, iii, 17.—DE KAY (1842), N. Y. Fauna, Fishes, 19.—STORER (1846), Synopsis, 276.—GÜNTHER (1859), Cat. Fishes, i, 75.—JORDAN (1877), Klippart's Report, 225.

? *Stizostedion canadense*, JORDAN (1876), Man. Vert. 225.—JORDAN & COPELAND (1876), Check List, 136.

Lucioperca grisea, DE KAY (1842), N. Y. Fauna, Fishes, 19.—STORER (1846), Synopsis, 276.—GÜNTHER (1859), Cat. Fishes, i, 76.—JORDAN (1874), Ind. Geol. Surv. 212.

Stizostedion griseum, MILNER (1875), Rept. U. S. Fish Com. 1872-3.—JORDAN (1876), Man. Vert. 225.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 36.—JORDAN & COPELAND (1876), Check List, 136.

Lucioperca borea, GRD. (1857), Proc. Acad. Nat. Sci. Phila. Nov. (not Okow or Horn Fish of Richardson, which is *S. vitreum*).

Stizostedion boreus, GRD. (1858), Pac. R. R. Survey, x, 31.

Stizostedion boreum, JORDAN & COPELAND (1876), Check List, 136.

I have never seen a specimen of the Sauger with the opercular spines exactly as represented in Smith's figure of his *canadensis*. I find, however, much variation in this respect, and I have seen specimens with 1, 2, 3, and 4 spines; and also specimens with the two sides unlike. Until it is known that there is a second species of Sauger in our waters differing from *griseum* by the constant presence of four opercular spines, it is safest to unite *griseum* and *canadense*.

The types of *Stizostedion boreus* Girard are preserved in the United States National Museum, and seem to be the common "Sauger", *S. canadense*. Part of Dr. Girard's description of this species is borrowed from Richardson, and applies to *S. vitreum*.

Body most elongated, more terete than in *Stizostethium* proper, with the back scarcely compressed, so broad that the lateral line may be seen in a view from above, the back somewhat angulated as it descends to the sides, the depth of the body $4\frac{1}{2}$ to 5 in length.

Head quite pointed, about $3\frac{1}{2}$ in length, the slope of the profile greater than in *Stizostethium*. Eye smaller, 5 to $5\frac{1}{2}$ in head in adult; mouth rather smaller, the lower jaw included; maxillary reaching to opposite posterior margin of eye.

Opercle with a sharp flat spine, usually a smaller one below it and an obscure one above; sometimes two or three smaller ones below, often none; the position and number of these spines extremely variable. Cheeks usually closely scaled, the hinder third or less sometimes naked. Median furrow on top of head closely scaled.

Coloration paler and more translucent, the shades less blended than in the *Stizostethia*; olive-gray above, sides considerably brassy or pale orange, with much black mottling, the black gathered into several definite dark areas, the most distinct of these being opposite the second dorsal; two others fainter, at each extremity of the spinous dorsal and one at base of caudal. These blotches are irregular and diffuse, but very characteristic. Young specimens are pale orange, with broad black shades.

Spinous dorsal with two or three rows of round black spots, one of each row on the membrane between each pair of spines; no distinct blotch on posterior part of the fin; a large black blotch at base of pectorals. Second dorsal with about three rows of irregular dark spots; caudal yellowish and dusky, almost barred. Fin-rays:—dorsal XII—1, 17, varying to XIII—1, 18; anal II, 12. Lateral line with 92 to 98 scales.

Pyloric cæca 4 to 7; four of them larger than the rest, of different lengths, all small and shorter than the stomach. The usual number is six, but the two small ones are sometimes one or both absent, sometimes duplicated. Length of adult 10 to 15 inches.

Habitat.—Great Lake Region, and Upper Mississippi Rivers, also in the Ohio, where it has been introduced from the lakes, through the canals, according to the fishermen.

The different form and coloration, particularly the markings of the dorsal fin, distinguish this species at once from the *Stizostethia*. This species has, moreover, always fewer dorsal rays, more scaly cheeks, and a different armature of the operculum.

The following is a catalogue of the known species of *Stizostethium*, with references to Dr. Günther's Catalogue of the Fishes in the British Museum, vol. i:—

1. STIZOSTETHIUM (CYNOPERCA) CANADENSE, (Smith) Jordan.

Lucioperca canadensis, Günther, i, p. 75.

Lucioperca grisea, Günther, i, p. 76.

Lucioperca (borca), Günther, i, p. 501 (*d. s.*).

2. STIZOSTETHIUM (STIZOSTETHIUM) VITREUM, (Mitchill) Jordan & Copeland.

Lucioperca americana, Günther, i, p. 74.

Bull. N. M. No. 10—4

3. STIZOSTETHIUM (STIZOSTETHIUM) SALMONEUM, *Rafinesque*.

4. STIZOSTETHIUM (LUCIOPERCA) LUCIOPERCA, (*Linnæus*) *Gill & Jordan*.

Lucioperca sandra, Günther, i, p. 75.

5. STIZOSTETHIUM (MIMOPERCA) VOLGENSE, (*Pallas*) *Gill & Jordan*.

Lucioperca wolgensis, Günther, i, p. 74.

ELASSOMINÆ.

33. ELASSOMA, *Jordan, gen. nov.*

In a collection of fishes lately sent to me by Prof. H. S. Reynolds, taken in the Little Red River, White County, Arkansas, I find two specimens of a curious little fish, representing a type entirely new to me, for which I would propose the above generic name (*ελασσωμα*, a being reduced or diminished).

The characters of the pharyngeal bones cannot well be ascertained on account of the small size of the specimens; I am, therefore, unable at present to definitely refer the genus to its proper family. It possibly, however, belongs to the family of *Cichlidae*, so numerously represented in the fresh waters of South America, of which but one species, *Heros cyanoguttatus* (B. & G.), has thus far been recorded from the United States.

The following are the generic characters of *Elassoma*, so far as they can be made out from the type-specimens:—

Form and to some extent aspect of *Aphododerus*, but more compressed; fins small; dorsal with five spines; anal with three; ventrals distinct, thoracic, each with one small spine and five soft rays; branchiostegals apparently five; mouth small, oblique, the lower jaw longest; each jaw apparently with a single row of large conical teeth; no vomerine teeth (?); cheeks and opercles scaly; body entirely scaly; no visible lateral line; branchiostegal membrane broadly united across the pectoral region; caudal fin truncate; vent normal.

Typical species *Elassoma zonata*, *Jordan*.

34. ELASSOMA ZONATA, *Jordan, sp. nov.*

Form rather elongate, compressed, especially behind; the nape rather broad and depressed, forming a straightish profile, the head narrowed forward, short but rather pointed, broadest below. Head 3 in length; depth about $3\frac{1}{2}$. Eye large, greater than snout; 3 in head. Mouth

considerably protractile, small, oblique, the maxillary scarcely reaching pupil.

Fin-rays:—Dorsal V, 7 (6 to 10; the exact number of soft rays I am unable to make out). Anal III, 6 (5 to 8); the spines of the dorsal continuous with the soft rays.

Color olive-green, finely punctulate everywhere; sides with about eleven parallel vertical bands of dark olive, about equal in width, narrower than the eye, the bands about as wide as the pale interspaces.

A roundish black spot, nearly as large as the eye, under the beginning of the spinous dorsal, just above the axis of the body, as in many South American *Cichlidæ*; soft fins faintly barred; cheeks and under parts of head profusely speckled with fine black dots, as in *Aphododerus cookianus*.

Length of each of the three specimens known just one inch. It probably grows to a somewhat larger size, but the fact that it has thus far apparently been overlooked by collectors, leads me to think that its maximum dimensions are quite small.

Habitat.—Little Red River, Arkansas; collector, Henry S. Reynolds; two specimens. Rio Brazos, Texas, a single specimen noticed in a bottle of Sunfishes in the United States National Museum, without other label than that of the locality.

This species seems to bear little relation to any of the genera of *Cichlidæ* described from South America by Dr. Günther or Professor Cope. I therefore propose to consider it as forming a distinct sub-family, and leave the matter of its relationships for future investigation.

APHODODERIDÆ.

35. ASTERNOTREMIA, Nelson, MSS., *nom. gen. nov.*

Sternotremia, NELSON, Bull. Ills. Mus. Nat. Hist. 1:76.

Some objection has been made to the name *Sternotremia* on the ground that it is anatomically incorrect and misleading, the vent not being in the "*sternon*", as in *Aphododerus*, but entirely behind it. As the name *Sternotremia* was given through a misunderstanding of the meaning of "*sternon*", Mr. Nelson proposes to modify it to *Asternotremia*, which term is anatomically correct, and indicates the chief distinction between this genus and *Aphododerus*.

36. APHODODERUS COOKIANUS, *Jordan*.

Proc. Acad. Nat. Sci. Phila. 1877, p. 60.

Many specimens of this species are in the United States National Museum from various points in Illinois. The chief distinctive character of this species, the small size of the scales, seems to be constant.

Specimens of an *Aphododerus*, from near New Orleans, the original locality of *Aphredoderus gibbosus* Le Sueur, seem to be identical with *A. sayanus*.

The etymology of "*Aphredoderus*" is apparently *αφροδός*, excrement; *δερή*, neck. The word should therefore be spelled *Aphododerus*.

37. ASTERNOTREMA MESOTREMA, *sp. nov.*

General form, appearance, and coloration of *Asternotremia isolepis* Nelson, but the vent not as in the latter species between the anterior bases of the ventral fins, but about an eye's diameter in front of them. Head nearly 3 times in length; depth $3\frac{1}{2}$; lateral line, 45 scales. Dorsal III, 8. Anal III, 7.

Type 9296, United States National Museum, from Georgia. Collector, Hugh M. Neisler; precise locality not indicated. Specimen $2\frac{1}{2}$ inches long, in very bad condition.

The peculiar position of the vent indicates a direct transition from the more generalized type of *Asternotremia* toward *Aphododerus*. In this species, it is about two-fifths of the distance between its normal position in the former genus and that of the latter, farther forward than in *Asternotremia isolepis*.

Since this paper was in press, I have received two more specimens which I refer to this species. They are in much better condition than the original types, and from them I am enabled to supplement and correct the original description.

Head 3 in length; depth $3\frac{1}{8}$; eye 4 in head; distance to dorsal $2\frac{1}{2}$ in body; base of dorsal 4.

Fin-rays:—D. III, 10; A. III, 6; V. 7. Scales in 60 to 70 rows, very small, and difficult to count.

Vent in front of the ventrals, about one-third the distance to the little knob at the throat.

Color precisely like that of the other members of the family.

Length of specimens $2\frac{3}{4}$ and $2\frac{1}{2}$ inches respectively. They were taken in Little Red River, Arkansas, by Prof. H. S. Reynolds.

The species of this family now known are the following, beginning with the form least specialized :—

1. *Asternotremia isolepis* Nelson.—Illinois, both in tributaries of Lake Michigan and of the Ohio and Mississippi.

2. *Asternotremia mesotrema* Jordan.—Georgia to Arkansas.

3. *Aphododerus cookianus* Jordan.—Wabash Valley ; at various points both in Indiana and Illinois. Many specimens in United States National Museum.

4. *Aphododerus sayanus* (Gilliams) De Kay.—Streams coastwise, New York, New Jersey, south to Louisiana.

UMBRIDÆ

38. UMBRA PYGMÆA, (*De Kay*) Bean, MSS.

Leuciscus pygmaeus, DE KAY, Fishes N. Y. 214.—STORER, Synopsis, 414.

Melanura pygmaea, BAIRD, Ninth Smithsonian Rept. 1855.

Fundulus fuscus, AYRES, Bost. Journ. Nat. Hist. iv, 296.—STORER, l. c. 431.

Umbra or *Melanura limi*, part, various authors (all quotations from Southern New York and streams of the Atlantic coast).

My friend Dr. T. H. Bean, of the Smithsonian Institution, calls my attention to the fact that the Mud Minnow of our eastern streams is quite a different species from the *Umbra* or *Melanura limi*, with which it has thus far been confounded by all writers who were aware of the relations of the fish. The synonymy of *M. pygmaea* is given above. Its characters are as follows :—

Head about 4 in length ; depth $4\frac{1}{2}$; body more terete and less compressed than in *M. limi* ; head broader, less depressed, with larger eye ; interorbital space more convex ; snout shorter, profile more gibbous. Dorsal 13 ; anal 7 (dorsal 14, anal 8 in *M. limi*). Lateral line 35.

Coloration :—dark brown, a series of whitish lengthwise stripes along the rows of scales ; a black bar at base of caudal ; no traces of vertical bars ; blackish bands forward, downward, and backward from eye ; a dark vertebral band. *M. limi* is more mottled, not striped, and always shows pale vertical cross-bars. Specimens examined from Tarboro', N. C., and from points in New Jersey and New York. The smaller number of branchiostegals (four instead of five or six) is the only character known to separate *Melanura* from *Umbra*.

ESOCIDÆ.

39. ESOX NOBILIOR, *Thompson*.

? *Esox masquinongy*, MITCHILL, "Mirror, 1824, 297" (not there!).*

? *Esox estor*, RICHARDSON, Fauna Boreali-Americana, iii, 1836, p. 127; and of several authors (not of Le Sueur, Journ. Acad. Nat. Sci. i, 1818, 413).

Esox nobilior, THOMPSON, Proc. Bost. Soc. Nat. Hist. iii, 1850, 163, 173, 305; and of recent writers generally.

It is not quite clear why Dr. Mitchill's name for this species should be set aside. Günther remarks (Cat. Fishes Br. Mus. 1866, vi, 227), "Mitchill has counted seventeen anal rays, and therefore it is probable that his typical specimens belonged to this species (*E. lucius*) and not to *E. estor* (*nobilior*), and rejects Mitchill's name on the supposition that the number of rays in the Muskallunge is 20 or 21. But, in point of fact, the number of anal rays is 16 to 18, usually one less than in *E. lucius*", instead of 3 or 4 more. Moreover, Mitchill's specimen was about 4 feet in length and weighed 30 pounds, a size unusual for the Pike, although specimens even larger are occasionally taken. Mitchill supposed that the fish in his possession was the Muskallunge; he described it, and named it on that supposition.

The following description was taken from a specimen about 3 feet long from Ecorse, Mich. (No. 10607, National Museum), and from three smaller specimens from Lake Huron:—

Depth 6 in length; head $3\frac{2}{3}$; general form of *E. lucius*, the head perhaps a trifle larger proportionally, 10 inches long in the larger specimen; eye about midway in head. Interorbital space transversely concave, with a prominent middle ridge; maxillary reaching to opposite middle of orbit.

Scaly part of cheeks about as wide as eye, beginning on a level with the eye and running backward, its lower edge nearly parallel with the profile. Scaly region of opercles similar. The amount of squamation is variable within narrow limits. Eight rows of scales on cheeks and about the same number on opercles. Scales on lateral line 150.

Fin-radii:—B. 18–17; 17–17; 18–19; 17–17, in four specimens. D. III, 17; III, 17; III, 17. Anal, II, 15; III, 14; III, 15. V. 12.

Color dark gray; sides with round dark spots of a grayish-black hue, nearly the color of the back, on a ground-color of grayish silvery;

* A search through the files of the Mirror for Mitchill's description has proved unsuccessful: it is not on the page cited by Dekay.

belly white; fins black, spotted as in *E. lucius*. Nearly every writer who has mentioned the Muskallunge has confounded it more or less with *E. lucius*. Günther's statement, "body with large rounded whitish spots," applies to *E. lucius*, and not at all to *E. nobilior*, the color in the latter species being gray, with rounded blackish spots.

I have compared European and American examples of *Esox lucius*, and am unable to find any difference whatever.

DORYSOMATIDÆ.

40. DORYSOMA CEPEDIANA, (*Le S.*) Gill.

Subsp. *HETERURA*, (*Raf.*) Jordan.

Comparison of specimens of *Dorysoma* from the Wabash River with others from Chesapeake Bay have convinced me that all properly belong to one species, but that our inland form may be recognized as a subspecies, for which the name *heterura** may be retained. Var. *heterura* differs chiefly in form; the back is much less arched, the axis of the body in specimens of about a foot in length being about half nearer the dorsal than the ventral outline. In *cepediana*, the axis of the body is usually about midway. The greater arch of the back in *cepediana* brings the beginning of the dorsal fin nearer snout than base of caudal; in *heterura*, the dorsal is about midway. The dorsal filament is usually longer in *heterura*, commonly longer than head; in *cepediana*, it is usually shorter than head. The less elevated nape renders the head of *heterura* rather more slender.

The name *Dorysoma* may as well be spelled correctly in accordance with its etymology.

CYPRINIDÆ.

GENERA OF AMERICAN CYPRINIDÆ.

The following is a semi artificial key to the genera of American *Cyprinidæ* which I am at present able to recognize.

Algoma Grd. I refer to *Hybognathus*, as one species which I have examined, *A. amara* has the alimentary canal elongate, and no characters

* *Clupea heterurus*, RAF., Am. Monthly Mag. Sept. 1818, 354, = *Dorosoma notata*, RAF., Ich. Oh. 1820, = *Chatoëssus ellipticus*, KIRT., 1835.

have been brought forward to distinguish *Algoma*. *Ciliola* Grd. seems to be equivalent to *Episema* Cope & Jordan, the dentition and position of the dorsal being the same in both. *Notropis* Raf. is revived in place of *Alburnellus*, *Notropis atherinoides* being evidently *Alburnus rubellus* Ag., or some closely related species. *Sarcedium* I unite with *Phenacobius* without hesitation, on examination of the types of each. *Photogenis* Cope I retain for the present, rather from the fact of the utter dissimilarity of the species with those of *Nototropis* than from ability to show any good distinctive characters. It is perhaps questionable whether the development of the peculiar satin-white pigment, which is found in the fins of the males in spring in every species of *Photogenis* and *Cyprinella* known in life, and in no species of any other group (except *Codoma*, a very near affine of *Cyprinella*), may not be a true generic character.

In the genera proposed by Girard, I consider the species first mentioned as the intended type, as I believe it is a known fact that Girard himself so considered it. Some species referred to certain genera will be found not to agree with the characters here given. Several such species need a reëxamination. It may be premised that the present arrangement is to be considered merely temporary, as a step from the present condition of chaos toward solid ground.

*. Dorsal fin without a strong developed spine; ventral fins not decurrent on the abdomen; dentary bones slender, arched, and widely separated except at their symphysis; opercular and mandibular bones without externally visible cavernous chambers; pharyngeal teeth well developed:

†. Air-bladder suspended in the abdominal cavity and surrounded by many convolutions of the long alimentary canal (*Campostominae*):

a. Teeth in the principal row 4-4, with oblique grinding surface and no hook; mouth inferior; lips sheathed; upper lip protractile; alimentary canal six to nine times length of body; sexual differences very great; males strongly tuberculate,

CAMPOSTOMA, 1.

††. Air-bladder contiguous to the roof of the abdominal cavity and above the alimentary canal (*Leuciscinae*):

‡. Rudimentary dorsal ray separated from first developed ray by membrane; head short, mouth small, inferior; upper jaw protractile; teeth 4-4, with grinding surface, not strongly hooked; males with the head tuberculate:

b. Alimentary canal elongate, two or three times length of body; teeth scarcely hooked; jaws normal:

c. Lateral line incomplete.....PIMEPHALES, 2.

cc. Lateral line complete.....HYBORHYNCHUS, 3.

bb. Alimentary canal short, about as long as body; teeth hooked; jaws with spoon-shaped bony expansions, somewhat as in *Tetrodon*,

COCHLOGNATHUS, 4.

‡. Rudimentary dorsal ray attached :

d. Teeth not molar, in one or two rows :

e. Maxillary without barbel :

f. Teeth in the principal row 4-4 :

g. Alimentary canal elongate, about four times length of body ; teeth one-rowed, cultriform, with oblique grinding surface and little or no hook ; premaxillary projectile ; lips attenuate, without sheath ; scales large :

h. Lateral line almost wanting ; mouth oblique ; dorsal in front of ventrals COLISCUS, 5.

hh. Lateral line complete ; mouth horizontal ; dorsal over ventrals :

— . Teeth elongate with narrow grinding surface and no hook ; body elongate HYBOGNATHUS, 6.

— — . Teeth short, with rather broad grinding surface and slight hook ; body short and rather stout ; size small DRONDA, 7.

gg. Alimentary canal short, about as long as body ; teeth raptatorial, usually strongly hooked :

i. Teeth with grinding surface developed, not crenate :

j. Dorsal fin beginning above ventrals (*i. e.*, above some part of base of ventrals) ; anal basis short :

— . Scales small, much longer than deep, with much of the surface exposed ; body stout, compressed ; teeth one-rowed, little hooked, the uppermost standing out above the surface of the bone ; size large (Subgenus ?) ALGANSEA,* 8.

— — . Scales large, about as long as deep, the usual surface exposed ; teeth one- or two-rowed, pretty strongly hooked ; size usually quite small (Subgenus ?) HYBORIS, 9.

— — — . Scales large, much deeper than long on the sides, the exposed surfaces very narrow ; teeth one or two-rowed, strongly hooked ; size moderate or large LUXILUS, 10.

jj. Dorsal fin beginning entirely behind ventrals, between ventrals and anal ; anal basis elongate LYTHURUS, 11.

ii. Teeth with the edges crenate ; dorsal fin beginning over middle or last rays of ventrals ; scales closely and smoothly imbricated ; teeth one-rowed (*Moniana*) or two-rowed (*Cyprinella*).

CYPRINELLA, 12.

iii. Teeth with edges entire and without grinding surface :

k. Lips thin, normal ; lateral line complete :

l. Species of small size and weak organization, with the mouth little cleft :

m. Scales comparatively thick, closely and smoothly imbricated, so that the exposed surfaces are higher than long ; dorsal fin beginning opposite between first and last ray of ventrals, rarely slightly posterior ; mouth subinferior, somewhat oblique ; males in spring developing a satin-white pigment in the tips of the vertical fins and in the skin of the abdomen ; snout tuberculate ; colors brilliant, pigmented,

(Subgenus ?) PHOTOGENIS, 13.

mm. Scales thin, much exposed ; no white satiny pigment (except in *Codoma* ?) :

* In *A. tincella*, the type of *Algansea* (*Leuciscus tincella* C. T. V., Hist. Nat. des Poissons xvii, 323), the teeth are said to be 4-4. In some species referred to *Algansea*, they are 5-5. These I refer for the present to *Myloleucus*, from the type of which genus they differ in having but one row of teeth.

- n.* Dorsal fin beginning entirely behind ventrals:
- o.* Body short and thick; the head almost globular; the mouth small, inferior; anal basis short... (Subgenus?) *CODOMA*, 14.
- oo.* Body elongate, with the mouth oblique, terminal, and the head more or less pointed; anal basis somewhat elongate,
NOTOTROPIS, 15.
- nn.* Dorsal fin beginning above some part of ventrals; aspect of
Nototropis *CLIOLA*, 16.
- ll.* Species of large size, with the body much elongated, subcylindrical; the head elongated, and the mouth deeply cleft, *Esox*-like; scales not large; pharyngeal bones long and slender, the teeth slightly hooked (sometimes 4-5) (voracious species of large size and strong organization, aspect of *Gila*),
PTYCHOCILUS, 17.
- kk.* Lips thin; lateral line incomplete or wanting.... PROTOPORUS, 18.
- kkk.* Lips thick, fleshy, enlarged behind; mouth small, inferior; dorsal fin beginning slightly anterior to ventrals; teeth one-rowed; lateral line complete..... PHENACOBIVS, 19.
- ff.* Teeth in the principal row 4-5 or 5-5 (or 4-4 in some species referred to *Hemitremia*):
- p.* Lateral line incomplete:
- g.* Dorsal over ventrals; scales large; teeth with grinding surface; alimentary canal short..... HEMITREMIA, 19,
- qq.* Dorsal behind ventrals; scales small:
- r.* Teeth with grinding surface, one-rowed; alimentary canal long,
CHROSOMUS, 20.
- rr.* Teeth without grinding surface, two-rowed; alimentary canal short..... PHOXINUS, 21.
- pp.* Lateral line complete:
- s.* Lips normal, without cartilaginous or bony sheath:
- t.* Anal basis not elongate—of 10 or fewer rays:
- u.* Teeth raptatorial, entire, without grinding surface:
- v.* Dorsal entirely behind ventrals; mouth large; scales small; body elongate; western species of large size with flattened head, arched back, and slender caudal peduncle (*Gila*) or eastern species of slender form and small size (*Clinostomus*) or western species of large size, intermediate in form and with the exposed surfaces of the scales broad (*Tigoma*),
GILA, 22.
- vv.* Dorsal over ventrals; mouth smaller; body stout and heavy,
SIBOMA, 23.
- uu.* Teeth not erenate, raptatorial, with grinding surface:
- w.* Dorsal over ventrals; body rather stout.... MYLOLEUCUS, 24.
- ww.* Dorsal entirely behind ventrals; body more elongate, compressed CHEONDA,* 25.
- tt.* Anal basis elongate, of 11 to 25 rays; body much compressed; dorsal fin entirely behind ventrals; lateral line decurved, complete:
- x.* Teeth one-rowed, not serrate, sharp-pointed, with masticatory surface, little hooked; base of caudal with many accessory rays; body elongate, large..... LAVINIA, 26.

* To this genus I refer at present *Tigoma pulchra*, *T. nigrescens*, and *T. gibbosa* of Girard. *Cheonda* differs from *Myloleucus* only in the more backward position of the dorsal and from *Gila* (*Tigoma*) in the presence of grinding surfaces on the teeth.

- xx. Teeth one-rowed, with grinding surface, and the edges crenate-serrate; belly sub-carinate; alimentary canal elongate,
NOTEMIGONUS, 27.
- xxx. Teeth two-rowed, entire, without grinding surface; alimentary canal not elongate.....RICHARDSONIUS, 28.
- ss. Both jaws with a hard or cartilaginous brown horny plate, large and conspicuous; mouth inferior (*Chondrostomatinae*):
- Teeth 5-4, club-shaped, entire, terminating in a hook, with the inner (grinding) surface obliquely cut; anal fin elongate; dorsal fin over ventrals; caudal fin with the accessory rudimentary rays very largely developed; alimentary canal elongate (?).....ACROCHILUS, 29.
- fff. Teeth usually 6-6, compressed, lanceolate, erect, very slightly bent inward, one-rowed; body elongate; jaws even; scales small; dorsal over ventrals; basal caudal rays largely developed; lower jaw sharp-edged, with a knob at the symphysis; no pseudobranchiae; intestinal canal elongate; size large...ORTHODON, 30.
- ffff. Teeth in the principal row 3-3, without grinding surface; isthmus very wide; dorsal behind ventrals.....TIAROGA, 31.
- ee. Maxillary provided with a small barbel:
- y. Premaxillaries not projectile, the skin of the lip and front continuous; teeth in the principal row 4-4, without grinding surface; scales small; dorsal behind ventrals; barbel terminal:
RHINICHTHYS, 32.
- yy. Premaxillaries projectile, a groove separating the upper lip from the forehead:
- z. Teeth without grinding surface:
- a. Teeth in the principal row 4-4; barbels terminal:
- b. Dorsal behind ventrals; scales small:
- c. Lateral line incomplete.....APOCOPE, 33.
- cc. Lateral line complete.....(Subgenus?) ERITREMA, 34.
- bb. Dorsal fin over ventrals; lateral line complete.....NOCOMIS, 35.
- aa. Teeth in the principal row 4-5; barbels lateral:
- d. Dorsal fin over ventrals; scales large, equal,
(Subgenus?) LEUCOSOMUS, 36.
- dd. Dorsal fin beginning over last rays of ventrals; scales smaller, crowded forward.....SEMOTILUS, 37.
- zz. Teeth with developed grinding surface:
- e. Dorsal fin behind ventrals; scales small.....AGOSIA, 38.
- ee. Dorsal fin directly over ventrals; scales large:
- f. Head compressed, rounded above.....POGONICHTHYS, 39.
- ff. Head broad, much depressed, nearly flat or concave above, resembling the head of a *Cyprinodont*.....PLATYGOBIO, 40.
- dd. Teeth molar, of the grinding type, without grooves or ridges, in three rows, the outer deciduous, 2 or 3, 2, 5-4, 2, 2 or 3; two or three of the teeth blunt and much enlarged; body elongate; head tapering:
- Angle of mouth with a barbel; upper jaw freely protractile; dorsal over ventrals.....MYLOCHILUS, 41.
- — No barbel; upper jaw not protractile; dorsal beginning behind ventrals.....MYLOPHARODON, 42.
- ** Opercular and mandibular bones with external cavernous chambers; air-bladder normal; dentary bones not united; fins without spines (*Cælophori*):

- g. Teeth hooked, without grinding surface, 4-4 in the principal row; lips normal; no barbel; intestines short; dorsal over ventrals; mouth small.....ERICYMBA, 43.
- ***. Dentary bones straight and flat, united throughout their length; mandible much contracted, incurved, tongue-like, a lobe on each side of it at base; air-bladder normal; bones of head not cavernous; fins without spines (*Exoglossina*):
- h. Teeth hooked, without grinding surface, 4-4 in the principal row; dorsal slightly behind beginning of ventrals; no barbel; premaxillaries not projectile.....EXOGLOSSUM, 44.
- ****. Dorsal fin with a strong spine composed of two, the posterior received into a longitudinal groove of the anterior; inner border of the ventral fins adherent to the body (*Plagopterinæ*):
- i. Body with small scales; teeth hooked, without grinding surface, the principal row 4-4; no barbels; dorsal behind ventrals. LEPIDOMEDA, 45.
- ii. Body entirely naked; teeth hooked, without grinding surface, the principal row 4-4; no barbels; dorsal behind ventrals.....MEDA, 46.
- iii. Body entirely naked; teeth hooked, without grinding surface, the principal row 5-4; a barbel at the extremity of the maxillary; dorsal behind ventrals.....PLAGOPTERUS, 47.
- *****. Pharyngeal teeth quite rudimental, replaced by a somewhat uneven ridge of the bone (*Graodontina*):
- j. Dorsal fin short, without spinous ray, opposite ventrals; anal fin short; mouth small, without barbel, the upper jaw somewhat longer; alimentary canal short; scales of moderate size; lateral line complete.....GRAODUS, 48.

41. LUXILUS SELENE, *sp. nov.*

A handsome and striking species allied to *L. cornutus*, but showing a tendency toward *Hybopsis*. Head short and stout, rounded above, $4\frac{1}{2}$ in length, depth about the same; body much more elongate than in *cornutus*, and the head proportionally shorter; mouth oblique, terminal, lower jaw included; eye very large, 3 in head, wider than snout and than interorbital space; snout blunt, quite short.

Fin-rays:—Dorsal I, 8. Anal I, 7. Dorsal fin about midway of body, over ventrals; dorsal very high; pectorals reaching two-thirds of the distance to ventrals, the latter to vent. Scales large, the exposed surfaces much less narrowed than in *cornutus*, 4-40-3, the lateral line little decurved.

Color bright steel-blue above, with a very distinct silvery band, which overlies a plumbeous shade; cheeks and belly silvery, a small, round, black caudal spot, a dark vertebral line; iris white; fins unmarked.

Teeth with marked masticatory surface, 2, 4-4, 2.

Length of specimen 4 inches.

Many specimens in United States National Museum; collected near Bayfield, Wis., by J. W. Milner.

This species seems to be distinct from all the numerous varieties of *L. cornutus* which I have examined.

42. LUXILUS ROSEUS, *sp. nov.*

Another handsome species, related to the last, but still more *Hybopsis*-like.

Body short, thick, and stout, much as in *Hyborhynchus notatus*; head $3\frac{7}{8}$ in length, depth $4\frac{1}{2}$; head rather short, thick, bluntly rounded; mouth moderate, slightly oblique; jaws about equal, the lower shutting within the upper in closed mouth; eye large, nearly 3 in head, about equal to snout, a little less than the broad interorbital space; scales large, 5-38-5, 15 before the dorsal fin, those along the sides with the exposed surfaces somewhat narrowed, but not very decidedly so, the arrangement being about midway between that observed in *L. cornutus* and that of the colored species of *Hybopsis*, such as *H. chrosomus*, *H. rubricroceus*, &c.

Fin-rays:—Dorsal I, 8. Anal I, 7. Dorsal fin high, inserted directly over ventrals, midway between snout and caudal; pectorals not reaching ventrals the latter to vent.

Color olivaceous above; scales dark-edged, a broad plumbeous lateral band passing through eye; lips black, a dark caudal spot, a dark vertebral line; anal region dusted with black points; cheeks and belly silvery; dorsal, anal, caudal, and most of pectorals rosy red; iris, top of head, and tip of snout also red; no tubercles on the type-specimens, which are probably immature, being about $2\frac{1}{2}$ inches in length.

Teeth 2, 4-4, 2, with developed grinding surfaces.

This small species forms a transition between *Luxilus* and *Hybopsis*.

Habitat.—Notalbany River, near Tickfaw, La.; collected December, 1876, by Dr. T. H. Bean. The types are now in the United States National Museum.

43. CYPRINELLA CALLIURA, *sp. nov.*

Body elongated, compressed, elevated in the middle, the profile before dorsal curved, and the snout projecting, forming a decided angle. Head convex above, densely tuberculate; muzzle rather pointed, overhanging the oblique mouth. Eye 4 in head, $1\frac{1}{3}$ in muzzle, $1\frac{2}{3}$ in interorbital width. Head $4\frac{2}{5}$ in length; depth $3\frac{1}{4}$ to 4.

Fin-rays:—D. I, 8; A. I, 8; V, 8. Dorsal fin inserted slightly behind ventrals; pectorals scarcely reaching $\frac{2}{3}$ to ventrals, the latter to vent.

Scales moderately elevated, 6-44-3; lateral line strongly decurved, forming an abrupt flexure just before the ventrals,—a peculiarity usually well marked and characteristic.

Teeth 1, 4-4, 1, strongly crenate.

Color in spirits pale; sides silvery; a pretty distinct black blotch on last rays of dorsal, as in *C. analostana*; a large, distinct, black caudal spot, ovate in form, half larger than eye, and extending up on the middle rays of caudal; the coloration therefore nearly that of *Photogenis stigmaturus*.

Length $4\frac{1}{2}$ in ches.

Types, No. 6865, United States National Museum, from Black Warrior River, Alabama. Collector, Prof. Winchell. Many specimens. Other specimens from Tangipahoa River, Louisiana, are also in the collection.

The species seems to resemble *C. cercostigma* Cope most, having a similar coloration; but that species is said to possess the teeth 2, 4, and to have somewhat different proportions. Several other similarly colored species of *Photogenis* and *Cyprinella* inhabit our southwestern waters.

44. PHOTOGENIS GRANDIPINNIS, *sp. nov.*

Body short, much compressed; back elevated; the form generally that of a young *Notemigonus*. Depth 4 in length. Head short, $4\frac{1}{4}$ in length, pointed, flattened above; mouth large, very oblique, the jaws just equal; eye large, 3 in head, about equal to snout and to interorbital space.

Fin-rays:—Dorsal I, 8; anal I, 10 or 11. Dorsal fin entirely posterior to ventrals, midway between eye and base of caudal, the fin greatly elevated, the longest ray being a little longer than head; anal fin also greatly elevated, reaching to within one eye's diameter of base of caudal; in smaller specimens less elevated, but in all very large, larger than in any other Cyprinoid known to me.

Scales with the exposed edges very narrow, 6-35-3; 16 large scales before dorsal; lateral line much decurved.

Color disappearing in alcohol; dorsal fin with the large black blotch, found in all the species of this group, unusually large and distinct, spreading forward on the anterior rays; a distinct black caudal spot, smaller than eye and deeper than long, running up on the middle rays; sides shining plumbeous; a very distinct bright silvery band from upper half

of eye straight to upper half of caudal, passing around the nose; below this sharply dusky; the opercles, lower half of eye, and lips in the dark band.

Teeth 1, 4-4, 1, hooked and sharp-edged.

Types, No. 9296, United States National Museum, from Georgia. Collector, Hugh M. Neisler; exact locality not specified. Numerous specimens in poor condition, showing no trace of tubercles.

Length $2\frac{1}{2}$ inches.

This small, handsome species is related to *P. pyrrhomelas* and *P. ænurus*, but needs no special comparison with either. The small size, the coloration, and immense development of the dorsal and anal fins distinguish it completely.

45. SEMOTILUS THOREAUIANUS, *sp. nov.*

Body short and rather stout, rather abruptly narrowed behind dorsal; depth $3\frac{3}{4}$ to $4\frac{1}{2}$ in length. Head short and thick, $3\frac{3}{4}$ in length, almost round in the larger specimen. Mouth large, oblique, the jaws about equal. Barbel lateral, better developed than in *S. corporalis*. Eye small, $4\frac{1}{2}$ to 5 in head, $1\frac{1}{3}$ in snout, about 2 in interorbital space, cheeks swollen; snout in a small male specimen 3 inches long, with a bilobed tubercle on each side.

Fin-rays:—Dorsal I, 8; anal I, 7. Dorsal entirely behind ventrals, its last ray over the first of anal; caudal peduncle slender; fins all short; pectorals not reaching nearly to ventrals, the latter not to vent.

Scales larger than in *S. corporalis*, not much crowded forward, 5-18-9; lateral line much decurved.

Coloration of *S. corporalis*, the black dorsal spot distinct.

Types, No. 9296, United States National Museum, from "Georgia". Collector, Hugh M. Neisler. Two specimens, the longest $3\frac{3}{4}$ inches long.

This species differs from *Semotilus corporalis* in its large scales, more backward dorsal, short head, and small size. The number of scales in the lateral line will probably always distinguish it.

This species is named in honor of the late Henry David Thoreau, of Concord, Mass., an excellent ichthyologist, one of the first to say a good word for the study of Cyprinidæ.*

* I am the wiser in respect to all knowledge, and the better qualified for all fortunes, for knowing that there is a minnow in the brook. Methinks I have need even of his sympathy and to be his fellow in a degree. * *

I would know even the number of their fin-rays, and how many scales compose the lateral line.—(Thoreau, Essay on Nat. Hist. Mass. 1842. <Excursions, ed. 1863, p. 56.)

46. NOCOMIS MILNERI, *sp. nov.*

Form somewhat of *Semotilus corporalis*, but more terete and elongate; depth $4\frac{1}{2}$ in length. Head about the same, flattish above, with a broad snout, which projects over the large, oblique mouth; barbel very apparent. Eye large, equal to snout, $3\frac{2}{3}$ in head, $1\frac{1}{2}$ in interorbital space; dorsal beginning over last rays of ventrals, I, 8; anal I, 8.

Scales quite small, crowded forward, as in *Semotilus corporalis*, 11-68-7, or thereabouts.

Colors of *Semotilus corporalis*, but the fins unspotted; a faint black band passing around snout through eye, somewhat silvery below.

Teeth 2, 4-1, 2, without grinding surface; length 4 to 6 inches.

Types, No. 130, United States National Museum. Collected in Lake Superior, by J. W. Milner, of the United States Fish Commission, for whom the species is named.

This species may be known from *N. prothemius* Cope by the larger scales and different mouth. Specimens of the latter are in the National Museum, from Evanston, Ill. *Gobio plumbeus* Ag., I do not know; the present species appears to be different.

47. CLIOLA ARIOMMA, (*Cope*) *Jordan*.

Photogenis ariommus, Cope, Trans. Am. Phila. Soc. 1866, 378.

This species is a true *Cliola* as I have defined that genus. The colored species referred by Prof. Cope and myself to *Episema*, viz, *E. callisema* and *E. pyrrhomelas*, are to be placed in *Photogenis* as defined in this paper. Their natural affinities are entirely with the latter group.

48. HYBOGNATHUS REGIUS, *Girard*.

Proc. Acad. Nat. Sci. Phila. 1856, 209.

This species, which has been for some time wrongly referred to *Hybopsis*, is a true *Hybognathus*, having the long intestines and cultriform pharyngeal teeth characteristic of the former genus. This fact was pointed out to me by Dr. T. H. Bean, who is now doing some very useful work in the way of verification of ascribed characters. *Hybognathus osmerinus* Cope is, so far as I can see on comparison of typical specimens, identical with *H. argyritis* Grd. *H. regius* is larger and deeper-bodied; *H. nuchalis* smaller.

49. NOTEMIGONUS CHRYSOLEUCUS, (Mitchill) Jordan.

In the Annals of the Lyceum of Natural History of New York for the present year, I have described as new a species of the genus *Notemigonus* from the Ocmulgee River, Georgia, under the name of *Notemigonus ischanus*, the description being drawn from a large number of young specimens.

I have lately had the opportunity of examining a number of fine adult individuals of this species from the same river. Prof. Cope has also obtained specimens from the St. John's River in Florida.

This species differs from the common *Notemigonus "americanus"* of the North and West chiefly in the following respects: (*a*) in the much greater size of the anal fin, the number of rays ranging from I, 15, to I, 17; (*b*) in the greater compression of the body, which at the same time is also more elongate; (*c*) in the larger eye; (*d*) in the rather more pointed head; and (*e*) in the coloration, the sides of the body in adult males being more or less rosy, and the lower fins, especially the ventrals, orange, verging on blood-red at their tips.

Linnaeus's original description of his *Cyprinus americanus* is as follows (*Systema Naturæ*, ed. x, 1758, p. 321):

Americanus 4. C. pinna ani radiis . . . , cirris plurimis.

Catesb. car. 2. p. 12. t. 12.

Alburnus americanus.

Habitat in America.

In the twelfth edition, 1766, p. 530, the following is substituted:

Americanus 23. C. pinna ani radiis xviii. B. 3. D. 9. P. 16. V. 9. A. 18. C. 27.

Habitat in Carolina. D. Garden.

Corpus rutili, cæruleo-argenteum. Linea lateralis admodum arcuata versus abdomen. Cauda bifida.

From this latter description, it is evident that the fish which Linnaeus had in mind was the southern *Notemigonus ischanus*, rather than the northern so-called *americanus*, which, by the way, is not certainly known to occur in Carolina.

Wherefore the southern species, *Notemigonus ischanus* Jordan, should be known as *Notemigonus americanus*, and the species of the Northern States, Great Lake Region, and Mississippi Valley as *Notemigonus chrysoleucus*, the name of *Cyprinus chrysoleucus* Mitchill being the oldest tenable name applied to it so far as known to the writer.

Leuciscus boscai Cuv. & Val. is probably identical with *Notemigonus*

americanus. Prof. Cope states that it is "probably a *Lavinia*", but he has not yet given us the grounds for his opinion. The figure of Cuvier and Valenciennes certainly bears little resemblance to *Lavinia*.

50. PLATYGOBIO GRACILIS, (*Richardson*) *Gill & Jordan*.

Cyprinus (*Leuciscus*) *gracilis*, RICHARDSON (1836), Fauna Boreali-Americana, iii, p. 120 (*Leuciscus gracilis* of copyists).

Leucosomus gracilis, HECKEL (1843), Fische Syriens, p. 52 (= Russeger's Reisen, p. 1042).

Pogonichthys communis, GIRARD (1856), Proc. Acad. Nat. Sci. Phila. p. 188, and elsewhere.

Platygobio communis, GILL (1876), Ichthyology, Capt. Simpson's Expl. p. 408, and in previous papers.

Leucosomus communis, GÜNTHER (1867), Cat. Fishes Brit. Mus. vii, p. —.

Comparison of various specimens of *Platygobio communis*, from Milk River, Montana, and elsewhere, with Richardson's description and figure of *Leuciscus gracilis*, leaves no doubt of the identity of the two species.

CATOSTOMIDÆ.

51. MYXOSTOMA PÆCILURA, *sp. nov.*

Form and general characters of *Myxostoma duquesnii*: Body rather elongate, somewhat elevated forward, moderately compressed; the greatest depth $4\frac{1}{3}$ in length; eye medium, $4\frac{1}{2}$ in length; mouth moderate; the lips plicate, rather full and subtruncate behind, as in *M. aureola*, *duquesnii*, etc.

Dorsal fin medium, of 13 developed rays; anal high, reaching when depressed considerably beyond base of caudal in one specimen, falling short in the other; pectoral fins rather long; ventrals with ten rays.

Caudal fin peculiar, strongly forked, the lower lobe in both the types being considerably longer and stronger than the upper lobe.

Scales large, 5-43-4.

Coloration of the body usual; of the fins quite unlike any other member of the genus.

Dorsal fin (in the type-specimens preserved in alcohol) chiefly red, with traces of a blackish bar about half-way up; pectorals chiefly red, whitish in front, with a large, elongate, diffuse black blotch near the middle; ventrals reddish, blackish toward their base; anal faintly reddish; the membrane black.

Upper lobe of the caudal fin red; lower lobe chiefly jet-black, except the last two developed rays and their membranes, which are abruptly

white. This produces a peculiar feature of coloration singular in this family, resembling in some slight degree that of the Cyprinodont genus *Xiphophorus*.

Types: Two specimens, numbered 16928 in the United States National Museum; collected by Mr. Fred. Mather in the Tangipahoa River, in Louisiana. The larger specimen is 10 inches long.

HYODONTIDÆ.

52. HYODON SELENOPS, *Jordan & Bean, sp. nov.*

Three well-marked species of the genus *Hyodon* inhabit the fresh waters of the United States, viz: *Hyodon chrysopsis* Richardson, of the water-basins of the Saskatchewan and Upper Missouri; *Hyodon tergisus* Le Sueur, the common "Moon-Eye" of the Great Lake region and Upper Mississippi; and an undescribed species for which the name of *Hyodon selenops* is suggested, inhabiting the waters of the Southern States. The various synonyms, *Hyodon clodatus* Le Sueur, *Abramis smithii* Rich., *Hyodon amphiodon*, *alosoides*, *heterurus*, and *vernalis* Raf., evidently belong to the common *Hyodon tergisus*, so that the proper nomenclature of these species is a simple matter.

Hyodon selenops is distinguished from the others by the more elongate body, which is less compressed than usual, and there is less difference between the curve of the back and that of the belly. The belly anterior to the ventral fins is transversely rounded, or even almost flattened instead of being obtusely carinated as in *H. tergisus*, or sharply carinated as in *H. chrysopsis*.

So strongly do *H. selenops* and *H. chrysopsis* differ in this respect that they would be considered as belonging to different genera were not the intermediate type *H. tergisus* still extant. Prof. Gill considers that, in the interests of conciseness of expression, the modifications of structure in the group should be expressed by at least subgeneric appellations, and in this I concur with him. Prof. Gill and myself, therefore, propose the new subgeneric term *Elattonistius* (ἐλάττωσις, smaller; ἄσπερας, banner—i. e., dorsal fin) for the *Hyodon chrysopsis*, and assign the characters given in the annexed synopsis. The scales are much less closely imbricated in *H. selenops*, and the number of series is, therefore, fewer. The dorsal fin is comparatively large, and nearly as long as high in front as in *H. tergisus*, and the pectoral fins are short, as in the latter species. But the most striking difference is in the size of the eye, which is exceed-

ingly large, forming nearly half the length of the side of the head in the smaller specimen, and about two-fifths in the larger.

The type of *H. selenops* is No. 19844 in the United States National Museum, from Chattanooga, Tenn.; length 8 inches. Another is from Montgomery, Ala.; and I have seen still others from the Cumberland River.

The following analysis of the species of *Hyodon* is drawn up from numerous specimens of *H. chrysopsis* taken by Dr. Elliott Cones, naturalist of the northern boundary survey, in Quaking Ash River; from specimens of *H. tergisus* from Ohio, and from the types of *H. selenops*. It will be noticed that the characters of *H. tergisus* are exactly intermediate, corresponding with the geographical range of the species. *H. chrysopsis* and *H. selenops* are, therefore, geographical races or varieties which have become so strongly differentiated from the common type that we are able to characterize them as species:

- *. Dorsal fin reduced, and with only about nine fully developed rays; abdomen sharply carinated (*Elatonistius*):
 - †. Dorsal fin very small, of about nine *developed* rays (besides the two or three rudiments), the length of its longest rays half greater than the length of the base of the fin; body deep, closely compressed; the belly strongly carinated both before and behind ventrals; eye moderate (about $3\frac{1}{2}$ in head); scales rather closely imbricated, 5-58-8; pectoral fins falcate nearly as long as the head, nearly or quite reaching ventrals; anal with 30 or 31 developed rays; head $4\frac{1}{2}$ in length; depth $3\frac{1}{2}$ CHRYSOPTIS.
- ** . Dorsal fin moderate and with eleven or twelve fully developed rays; abdomen more or less obtuse (*Hyodon*):
 - †. Dorsal fin larger, of about 12 developed rays; its longest rays scarcely longer than the base of the fin; form of body intermediate; the belly in front of ventrals obtusely carinated; eye large, about 3 in head; scales medium, 5-58-8; pectoral fins decidedly shorter than head, not reaching nearly to ventrals; anal rays 28 or 29; head $4\frac{1}{2}$ in length, the depth about 3 TERGISUS.
 - †† Dorsal fin moderate, of 11 or 12 developed rays, nearly as long as high in front; body elongate, not greatly compressed; the belly in front of ventrals transversely rounded, not carinated; eye very large, about $2\frac{1}{2}$ in head; scales loosely imbricated, 4-50-7; pectoral fins considerably shorter than head, not reaching nearly to ventrals; anal rays 27; head $4\frac{1}{2}$ in length; depth about 4 SELENOPTIS.

B.--SYNOPSIS OF THE FRESH-WATER SILURIDÆ OF THE UNITED STATES.

The nomenclature of the *Siluridæ* of our fresh waters has been for a long time in a very unsettled state, owing to the accumulation in our descriptive works of a large number of nominal species, and to the general lack of sharp characterizations in the published descriptions.

The writer has attempted to go over the subject critically, with a view to ascertaining the basis on which each species rests, and to eliminating all those whose claims to recognition are doubtful. I have accordingly considered every nominal species as invalid, unless either from the description itself or from the examination of specimens, some differences apparently permanent could be appreciated. Some species not here recognized will doubtless prove valid, but at least nine-tenths of those not admitted are simply spurious, either based on individual peculiarities of specimens, or more often on ignorance of species previously described.

This paper is based primarily on the collections in the United States National Museum. The writer has also examined most of the specimens of *Siluridæ* preserved in the Museum of the Academy of Natural Sciences at Philadelphia. Most of the species here recorded are also in the author's own collection, deposited in the Museum of Butler University at Indianapolis, Ind.

The drawings accompanying this paper were nearly all made by Mr. Ernest R. Copeland from specimens in the author's collection. Those of *Amiurus nigrilabris*, *Amiurus mississippiensis*, and *Amiurus nireiventris* were drawn by Miss Belle Sherman from Prof. Cope's types in the Museum of the Academy. A few others were drawn by Mr. Todd from specimens in the National Museum. These drawings are to be considered rather as illustrative diagrams than as pictures. They are drawn with a view to showing especially those characters which I consider to be specific in our *Siluridæ*, viz. the general outline, the position of the dorsal fin, the size, number of rays, and position of the anal fin, the form of the caudal fin, and the size and form of the pectoral spines. These features

have in all cases been drawn with considerable care and regard to accuracy.

The writer is under great obligations to Prof. Theodore Gill, of the Smithsonian Institution, for aid of various kinds, both in his work on the *Siluridae* and in the prosecution of his ichthyological studies generally.

In the following descriptions, the "length of the body" is always measured along the sides from the snout to the middle of the *base* of the caudal fin.

All of our species of fresh water *Siluridae* belong to the group called, by Dr. Gill, in 1862, *Ictaluri*. In 1864, Dr. Günther recognized the same group; but "to show his originality", as Prof. Agassiz used to say, he, without assigned reason, changed the name to *Amiurina*.

The following are the characters ascribed by Prof. Gill to the *Ictaluri* (Report on Ichthyology, Captain Simpson's Explorations across the Great Basin of Utah in 1859, p. 416).

GROUP ICHTHÆLURI.

The body is more or less elongated, compressed posteriorly, and terminating in a well-developed caudal fin. The skin is naked and unprovided with sucking cups.

The head in profile presents the appearance of a more or less elongated cone, and is covered with a skin which is generally quite thick. It is more or less flattened, and broad above, and gradually becomes narrowed to the convex snout. There is never a casque, or helmet. The supraoccipital terminates in a point.

There are eight barbels: the two maxillary, constant in the family; a pair in front of the posterior nasal apertures; and two pairs arranged in a curved line behind the lower jaw.

The nostrils form nearly a transverse parallelogram between the intermaxillaries and the eyes; the anterior are suboval or subcircular, and the posterior linear, with a raised margin, from the front of which the upper barbels originate.

The eyes are generally placed in the anterior half of the head.

The branchial apertures are ample, continued from the supero-posterior angles of the opercula to beneath the throat.

The group of *Ichthæluri* consists of four genera: *Ichthælurus*, *Amiurus*, *Pelodichthys*, and *Noturus*. All the species known to be genuine members of this group are North American, and all are included in the

following synopsis. A Chinese species, *Pimelodus cantonensis*, referred by Dr. Günther to *Amiurus*, is excluded, as its real position is perhaps uncertain. The species are most abundant in the Mississippi Valley and Great Lake Region. Some of them occur in all our waters east of the Rocky Mountains, but as yet none are known from the Pacific Slope.

ANALYSIS OF THE GENERA OF ICHTHYLURUS.

- *. Adipose fin with its posterior margin free, not connected with the caudal fin:
 †. Intermaxillary band of teeth convex in front, abruptly truncate behind, without lateral backward processes; branchiostegals 8 or 9 (rarely 10 or 11); ventral fins normally with 8 rays:
 ‡. Supraoccipital bone prolonged backward, its apex emarginate, receiving the pointed anterior end of the second interspinal, thus forming a continuous bony bridge from the snout to the base of the dorsal; branchiostegals 8 or 9; head elongate; mouth small, terminal, the upper jaw the longer; anal fin elongate, of 24 to 34 rays; caudal fin finuate; body elongate, more or less slender, silvery, covered with thin skin.....*ICHTHYLURUS*.
 ††. Supraoccipital bone free behind, not connected with the interspinal; branchiostegals normally 9 (varying from 8 to 11); head broad; mouth broad, terminal; anal fin moderate or rather long, with 15 to 27 rays; caudal fin usually truncate, but often more or less deeply emarginate or even forked; body usually more or less shortened, covered with a rather thick skin.....*AMURUS*.
 ††. Intermaxillary band of teeth convex in front, with a lateral backward extension on each side; branchiostegals normally 12; supraoccipital bone free behind; head long, broad, and flat; mouth large, the lower jaw always the longer; anal fin short, of 12 to 14 rays; ventrals with 9 rays; caudal fin truncate, its numerous rudimentary rays recurrent above and below the caudal peduncle; number of vertebrae increased; body elongate, covered with thick skin....*PELODICHTHYS*.
 **. Adipose fin long and low, keel-like, adnate to the back, more or less perfectly continuous with the caudal fin; supraoccipital bone free behind; branchiostegals 9; anal fin short, with 11 to 20 rays; caudal fin rounded, with numerous rudimentary rays recurrent on the caudal peduncle; ventral rays usually 9; form various, but body usually more or less elongate, depressed in front, compressed behind, covered with a thickish but semi-transparent skin; size small, *NOTURUS*.

CATALOGUE OF NOMINAL SPECIES, WITH IDENTIFICATIONS.

In the following list are given, in chronological order, the names thus far proposed for our fresh-water *Siluridæ*. In the right-hand column is my identification of each species. Those species of which I have examined the original types are designated by a star (*).

| Nominal species. | Date. | Identification. |
|-------------------------------------|-------|--------------------------------|
| <i>Silurus catus</i> , L..... | 1758 | <i>Amiurus catus</i> . |
| <i>Silurus gyrimus</i> , Mit..... | 1817 | <i>Noturus gyrimus</i> . |
| <i>Silurus punctatus</i> , Raf..... | 1818 | <i>Ichthæurus punctatus</i> . |
| <i>Silurus olivaris</i> , Raf..... | 1818 | <i>Pelodichthys olivaris</i> . |
| <i>Noturus flavus</i> , Raf..... | 1818 | <i>Noturus flavus</i> . |

| Nominal species. | Date. | Identification. |
|--|-------|-----------------------------------|
| <i>Pimelodus albidus</i> , Le Sueur | 1819 | <i>Aminurus albidus</i> . |
| <i>Pimelodus nebulosus</i> , Le S | 1819 | <i>Aminurus catus</i> . |
| <i>Pimelodus æneus</i> , Le S | 1819 | <i>Pelodichthys olivaris</i> . |
| <i>Pimelodus caudafurcatus</i> , Le S | 1819 | <i>Ichthælorus punctatus</i> . |
| <i>Pimelodus nigricans</i> , Le S | 1819 | <i>Aminurus nigricans</i> . |
| <i>Pimelodus natalis</i> , Le S | 1819 | <i>Aminurus natalis</i> . |
| <i>Noturus luteus</i> , Raf | 1819 | <i>Noturus flavus</i> . |
| <i>Pilodictis limosus</i> , Raf | 1819 | <i>Pelodichthys olivaris</i> . |
| <i>Silurus maculatus</i> , Raf | 1820 | <i>Ichthælorus punctatus</i> . |
| <i>Var. erythroptera</i> , Raf | 1820 | <i>Ichthælorus punctatus</i> . |
| <i>Silurus pallidus</i> , Raf | 1820 | <i>Ichthælorus punctatus</i> . |
| <i>Var. marginatus</i> , Raf | 1820 | <i>Ichthælorus punctatus</i> . |
| <i>Var. lateralis</i> , Raf | 1820 | <i>Ichthælorus punctatus</i> . |
| <i>Var. leucoptera</i> , Raf | 1820 | <i>Ichthælorus punctatus</i> . |
| <i>Silurus ceruleus</i> , Raf | 1820 | <i>Ichthælorus punctatus</i> . |
| <i>Var. melanurus</i> , Raf | 1820 | <i>Ichthælorus punctatus</i> . |
| <i>Silurus argentinus</i> , Raf | 1820 | <i>Ichthælorus punctatus</i> . |
| <i>Silurus nebulosus</i> , Raf | 1820 | <i>Pelodichthys olivaris</i> . |
| <i>Silurus viscosus</i> , Raf | 1820 | <i>Pelodichthys olivaris</i> . |
| <i>Silurus lividus</i> , Raf | 1820 | <i>Aminurus natalis lividus</i> . |
| <i>Var. fuscatus</i> , Raf | 1820 | <i>Aminurus natalis lividus</i> . |
| <i>Silurus melas</i> , Raf | 1820 | <i>Aminurus melas</i> . |
| <i>Silurus cupreus</i> , Raf | 1820 | <i>Aminurus lividus cupreus</i> . |
| <i>Silurus xanthocephalus</i> , Raf | 1820 | <i>Aminurus xanthocephalus</i> . |
| <i>Silurus limosus</i> , Raf | 1820 | <i>Pelodichthys olivaris</i> . |
| <i>Pimelodus argyrus</i> , Raf | 1820 | <i>Ichthælorus punctatus</i> . |
| <i>Pimelodus lutescens</i> , Raf | 1822 | <i>Pelodichthys olivaris</i> . |
| <i>Pimelodus insignis</i> , Rich | 1836 | <i>Noturus insignis</i> . |
| <i>Silurus (Pimelodus) cænosus</i> , Rich | 1836 | <i>Aminurus natalis cænosus</i> . |
| <i>Silurus (Pimelodus) nigrescens</i> , Rich | 1836 | <i>Aminurus nigricans</i> . |
| <i>Silurus (Pimelodus) borealis</i> , Rich | 1836 | <i>Aminurus borealis</i> . |
| <i>Pimelodus punctulatus</i> , Cuv. & Val | 1840 | <i>Pelodichthys olivaris</i> . |
| <i>Pimelodus furcatus</i> , Cuv. & Val | 1840 | <i>Ichthælorus furcatus</i> . |
| <i>Pimelodus furcifer</i> , Cuv. & Val | 1840 | <i>Ichthælorus punctatus</i> . |
| <i>Pimelodus lemniscatus</i> , Le Sueur | 1840 | <i>Noturus insignis</i> . |
| <i>Pimelodus vulgaris</i> , Thompson | 1842 | <i>Aminurus vulgaris</i> . |
| <i>Pimelodus pullus</i> , De Kay | 1842 | <i>Aminurus pullus</i> . |
| <i>Pimelodus atrarius</i> , De Kay | 1842 | <i>Aminurus catus</i> . |
| <i>Pimelodus felis</i> , Agassiz | 1850 | <i>Aminurus catus</i> . |
| <i>Pimelodus gracilis</i> , Hough* | 1852 | <i>Ichthælorus punctatus</i> . |
| <i>Pimelodus marmoratus</i> , Holbrook* | 1855 | <i>Aminurus marmoratus</i> . |
| <i>Pimelodus vulpes</i> , Grd.* | 1858 | <i>Ichthælorus punctatus</i> . |
| <i>Pimelodus catulus</i> , Grd.* | 1858 | <i>Aminurus melas</i> . |

| Nominal species. | Date. | Identification. |
|--|-------|---|
| <i>Pimelodus felinus</i> , Grd.* | 1858 | <i>Amiurus natalis lividus</i> . |
| <i>Pimelodus antoniensis</i> , Grd.* | 1858 | <i>Amiurus natalis antoniensis</i> . |
| <i>Pimelodus ailurus</i> , Grd.* | 1858 | <i>Amiurus vulgaris ælurus</i> . |
| <i>Pimelodus lupus</i> , Grd.* | 1858 | <i>Amiurus lupus</i> . |
| <i>Pimelodus olivaceus</i> , Grd.* | 1858 | <i>Ichthæurus punctatus</i> . |
| <i>Pimelodus affinis</i> , Grd.* | 1859 | <i>Ichthæurus fuscatus</i> . |
| <i>Synechoglanis beadlei</i> , Gill* | 1859 | <i>Ichthæurus punctatus</i> . |
| <i>Pimelodus houghi</i> , Grd.* | 1859 | <i>Ichthæurus punctatus</i> . |
| <i>Pimelodus hoyi</i> , Grd.* | 1859 | <i>Amiurus catus</i> . |
| <i>Pimelodus coufinis</i> , Grd.* | 1859 | <i>Amiurus melas</i> . |
| <i>Pimelodus cupreoides</i> , Grd.* | 1859 | <i>Amiurus natalis lividus</i> . |
| <i>Pimelodus dekayi</i> , Grd. | 1859 | <i>Amiurus vulgaris</i> . |
| <i>Pimelodus lynx</i> , Grd.* | 1859 | <i>Amiurus albidus</i> . |
| <i>Pimelodus puma</i> , Grd.* | 1859 | <i>Amiurus natalis</i> . |
| <i>Pimelodus vulpeculus</i> , Grd.* | 1859 | <i>Amiurus catus</i> . |
| <i>Pimelodus platycephalus</i> , Grd.* | 1859 | <i>Amiurus platycephalus</i> . |
| <i>Pimelodus megalops</i> , Grd.* | 1859 | <i>Ichthæurus punctatus</i> . |
| <i>Pimelodus graciosus</i> , Grd.* | 1859 | <i>Ichthæurus punctatus</i> . |
| <i>Pimelodus hammondi</i> , Abbott | 1860 | <i>Ichthæurus punctatus</i> . |
| <i>Pimelodus notatus</i> , Abbott | 1860 | <i>Ichthæurus punctatus</i> . |
| <i>Ictalurus simpsoni</i> , Gill* | 1861 | <i>Ichthæurus punctatus</i> . |
| <i>Amiurus obesus</i> , Gill* | 1861 | <i>Amiurus melas</i> . |
| <i>Noturus occidentalis</i> , Gill* | 1861 | <i>Noturus flavus</i> . |
| <i>Amiurus meridionalis</i> , Günther | 1864 | <i>Ichthæurus meridionalis</i> . |
| <i>Noturus platycephalus</i> , Gthr | 1864 | <i>Noturus flavus</i> . |
| <i>Gronias nigrilabris</i> , Cope* | 1864 | <i>Amiurus nigrilabris</i> . |
| <i>Noturus marginatus</i> , Baird* | 1869 | <i>Noturus insignis</i> . |
| <i>Ictalurus keviniskii</i> , Stauffer | 1869 | <i>Amiurus albidus</i> . |
| <i>Ictalurus macaskoyi</i> , Stauffer | 1869 | <i>Amiurus albidus</i> . |
| <i>Amiurus mississippiensis</i> , Cope | 1870 | <i>Amiurus catus (mississippiensis)</i> . |
| <i>Amiurus lophius</i> , Cope | 1870 | <i>Amiurus lophius</i> . |
| <i>Amiurus niveiventris</i> , Cope | 1870 | <i>Amiurus niveiventris</i> . |
| <i>Noturus exilis</i> , Nelson* | 1876 | <i>Noturus exilis</i> . |
| <i>Noturus leptacanthus</i> , Jordan* | 1877 | <i>Noturus leptacanthus</i> . |
| <i>Amiurus brunneus</i> , Jordan* | 1877 | <i>Amiurus brunneus</i> . |
| <i>Noturus minrus</i> , Jordan* | 1877 | <i>Noturus minrus</i> . |
| <i>Noturus cleutherus</i> , Jordan | 1877 | <i>Noturus cleutherus</i> . |
| <i>Ichthæurus robustus</i> , Jordan* | 1877 | <i>Ichthæurus robustus</i> . |
| <i>Amiurus erebennus</i> , Jordan* | 1877 | <i>Amiurus erebennus</i> . |
| <i>Amiurus natalis analis</i> , Jordan | 1877 | <i>Amiurus natalis analis</i> . |
| <i>Noturus sialis</i> , Jordan | 1877 | <i>Noturus sialis</i> . |

GENUS ICHTHÆLURUS,* (*Rafinesque*) Gill.

Ictalurus, RAFINESQUE (1820), *Ichthyologia Obiensis*, 61.

Elliops, RAFINESQUE (1820), *Ichthyologia Obiensis*, 62.

Synechoglanis, GILL (1859), *Annals Lyc. Nat. Hist.* vii, 39.

Ictalurus, GILL (1862), *Proc. Boston Soc. Nat. Hist.* 41.

Ichthælurus, COPE (1869), *Journ. Acad. Nat. Sci. Phila.* 237.

ETYMOLOGY.—*ιχθυς*, fish; *αιλουρος*, cat.

TYPE.—*Silurus punctatus*, Rafinesque.

Body elongated, slender, and much compressed. The caudal peduncle is short but slender, and presents behind the anal an elongated elliptical section.

Head conical in profile, compressed, and with the sides sloping downward and outward. The supraoccipital bone is prolonged backward, and its emarginated apex receives the acuminate anterior point of the second interspinal. The skull is covered by a thin tense skin, through which the sculpture of the bones is apparent. Eyes large and almost entirely lateral. Mouth small, transverse, and terminal. The upper jaw protrudes beyond the lower. Teeth subulate and aggregated into a short, laterally truncated band on each jaw. Branchiostegal rays, 8 or 9. Dorsal fin situated over the interval between the pectoral and ventral fins, higher than long, with one long spine and usually six articulated rays. Adipose fin pedunculated over the posterior portion of the anal. Anal fin long, and provided with from 25 to 35 rays; it commences near the anus. Ventral fins each with one simple and seven branched rays. Pectoral fins each with a stout spine, retrorse-serrate within, and about nine branched rays. The serræ of the pectoral spine vary with age and circumstances, and do not in this genus give good specific characters. Caudal fin elongated and deeply forked, with the lobes equal and pointed.

The genus *Ichthælurus* is at once recognized by the forked caudal fin, its silvery or olivaceous colors, and by its compressed, elongated, and slender body, which give to it a peculiarly graceful appearance, very unlike that of the stout, obese, and large-headed *Amiuri*. The head is smaller in proportion than in *Amiurus*, more compressed, and not covered by so thick a skin; the mouth is proportionally much smaller. But the only invariable generic distinction resides in the mode of inser-

* The characters of the genera of *Siluridae* as here given are arranged from Prof. Gill's Report on Ichthyology of Captain Simpson's Explorations Across the Great Basin of Utah, pp. 416-431, with some additions and modifications.

tion of the supraoccipital or interparietal bone into the head of the second interspinal. A firm and immovable bridge is thus formed, which gives an uninterrupted passage from the dorsal fin to the snout. The silvery coloration is also a marked distinguishing feature.

It is not generally true that the species of *Ichthælurus* reach a larger size than those of the other genera. *Amiurus nigricans* and *Pelodichthys olivaris* far exceed in size any of the species of *Ichthælurus*.

ANALYSIS OF SPECIES.*

- *. Anal fin extremely elongate, its base about one-third the length of the body (without caudal); its rays 32 to 34 in number; eye small, wholly anterior, the middle of the head being entirely behind its posterior margin; head small, about $4\frac{1}{2}$ in length; depth 4 in adults to $5\frac{1}{2}$ in younger specimens; slope from dorsal to snout somewhat concave, especially in adults; pectoral spine $1\frac{1}{2}$ in head; skin thin; color brightly silvery FURCATUS, 1.
- ** . Anal fin shorter, $3\frac{1}{2}$ to 4 in length; its rays 24 to 30.
- †. Eye moderate-sized, anterior, the middle of the head being wholly behind it; anal rays 27 to 30; body comparatively stont and deep, compressed behind; the dorsal region elevated; depth $3\frac{1}{2}$ to 4 in length; head pretty large, $4\frac{1}{2}$ to $4\frac{3}{4}$ in length, one-third longer than broad; spines moderate, strong, little more than half-head; profile from dorsal to snout more or less depressed or concave; skin rather thick; colors pale ROBUSTUS, 2.
- ††. Eye large, placed mesially, the middle of the length of the head falling within the eye; anal rays 25 to 29; head moderate, about 4 in length; depth about 5; body more elongate and less deep than in *robustus*, the head rather smaller, the eye larger, and the dorsal region less elevated; pectoral and dorsal spines long, each about $1\frac{3}{4}$ in length of head PUNCTATUS, 3.

1. ICHTHÆLURUS FURCATUS, (Cuv. & Val.) Gill.

Fork-tailed Channel Cat.

(Figs. 1 and 2.)

Pimelodus furcatus, CUV. & VAL. (1849), xv, 136.—DE KAY (1842), Fishes N. Y. 187.—STORER (1846), Synopsis, 403.

Ictalurus furcatus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—JORDAN (1876), Man. Vert. 309.—JORDAN & COPELAND (1876), Check List, 159.

Amiurus furcatus, GÜNTHER (1864), Cat. Fishes, v, 103.

Pimelodus affinis, BAIRD & GIRARD (1854), Proc. Acad. Nat. Sci. Phila. 26.—GIBBARD (1859), Ich. U. S. and Mex. Bound. 32.

Ictalurus affinis, GILL (1862), l. c. 43.—JORDAN & COPELAND, l. c. 159.

Amiurus affinis, GÜNTHER (1865), l. c. 103.

Habitat.—Mississippi Valley to Texas.

This species is not nearly so common nor so well known as the *punctatus*. I am unable to distinguish the type specimens of *affinis* from *furcatus*.

* *I. meridionalis* is here omitted, the description not being sufficiently full to allow a satisfactory contrast of its characters with those of *I. robustus*.

2. *ICHTHÆLURUS ROBUSTUS*, *Jordan, sp. nov.***Robust Channel Cat.**

(Figs. 3 and 4.)

Ictalurus furcatus, NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.*Habitat*.—Ohio and Mississippi Rivers.

This is a large robust species said to be not uncommon in the Ohio and Mississippi Rivers, and which seems to have been thus far confounded with the related *I. furcatus*. From that species it differs obviously in the shorter anal fin, which has 27 to 30 rays, and forms but one-fourth of the length of the body, without the caudal. It is also a stouter fish, with a larger head and a more elevated dorsal region. From *I. punctatus* this species differs notably by the anterior position of the eyes and by the greater elevation of the dorsal region. Old specimens have the profile somewhat concave as in *I. furcatus*.

The type is a large specimen, about 18 inches long, numbered 20056 in the National Museum. The record of the locality is lost. Another specimen, figured in this paper, was sent me by Prof. S. A. Forbes, from the Ohio River at Cairo. Professor Forbes thinks it common in the Lower Ohio and Mississippi, but that it rarely ascends the Illinois and other tributary rivers.

3. *ICHTHÆLURUS PUNCTATUS*, (*Raf.*) *Jordan.***Blue Cat—White Cat—Silver Cat—Channel Cat.**

(Figs. 5 and 6.)

Silurus punctatus, RAF. (1818), Amer. Monthly Mag. and Critical Review, Sept. 359.

Ictalurus punctatus, JORDAN (1876), Bull. Buff. Soc. Nat. Hist. 95; (1876), Manual of Vertebrates, 300.—JORDAN & COPELAND (1876), Check List in Bull. Buff. Soc. Nat. Hist. 159.—JORDAN (1877), Annals Lyc. Nat. Hist. N. Y. — —NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.

Pimelodus caudafurcatus, LE SUEUR (1819), Mémoires du Muséum, v, 152.*Amiurus caudafurcatus*, GÜNTHER (1864), Catalogue of Fishes, v, 102.

Silurus maculatus, RAF. (1820), Quarterly Journal of Science, Literature, and Arts, London, 48 (et var. *erythroptera*, p. 49).

Pimelodus (Ictalurus) maculatus, RAF. (1820), Ichthyologia Ohiensis, 62.

Silurus pallidus, RAF. (1820), Quart. Journ. Sci. Lit. Arts London, 49 (et var. *marginalis*, *lateralis*, *leucoptera*).

Pimelodus pallidus, RAF. (1820), Ich. Oh. 63.—KIRTLAND (1833), Report Zool. Ohio, 169, 194.

Silurus ceruleus, RAF. (1820), Quart. Journ. Sci. Lit. Arts London, 49 (et var. *melanurus*).

Pimelodus ceruleus, RAF. (1820), Ich. Ohiensis, 63.—KIRTLAND (1833), Rept. Zool. Ohio, 169, 194; (1846), Bost. Journ. Nat. Hist. iv, 332.—STORER (1846), Synopsis Fishes N. A. in Mem. Nat. Acad. Sci. 405. (All these descriptions refer more or less to *Amiurus nigricans*).

- Ictalurus cærulescens*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—COPE (1865), Proc. Acad. Nat. Sci. Phila. 85; (1870), Proc. Am. Philos. Soc. 489.—JORDAN (1874), Ind. Geol. Survey, 222.—GILL (1876), Ich. Capt. Simpson's Exped. 417.
- Ichthæurus cærulescens*, COPE (1869), Journ. Acad. Nat. Sci. 237.
- Silurus argentinus*, RAF. (1820), Quart. Journ. Sci. Lit. Arts London, 50.
- Pimelodus argyrus*, RAF. (1820), Ichthyologia Ohiensis, 64.
- Pimelodus furcifer*, CUV. & VAL. (1840), xv, 139.—“HYRTL (1859), Denkschr. Akad. Wiss. Wien, 16”.—“KNER, Sitzgsber. Akad. Wiss. Wien, xxvi, 421.”
- Ictalurus furcifer*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—JORDAN (1876), Manual Vert. 300.
- Pimelodus gracilis*, HOUGH (1852), Fifth Ann. R.pt. Reg. Univ. Condition State Cabinet Nat. Hist. Albany, 26.
- Synechoglanis gracilis*, GILL (1859), Trans. Lye. Nat. Hist. 3 (reprint).
- Ictalurus gracilis*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—COPE (1865), Proc. Acad. Nat. Sci. Phila. 85.—JORDAN (1876), Man. Vert. 300.—JORDAN & COPELAND (1876), Check List, 159.
- Pimelopus vulpes*, GIRARD (1858), Proc. Acad. Nat. Sci. Phila. 170; (1859), U. S. and Mex. Bound. Surv. 33.
- Ictalurus vulpes*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—JORDAN & COPELAND (1876), Check List, 159.
- Pimelodus olivaceus*, GIRARD (1858), Pac. R. R. Survey, x, 211.
- Ictalurus olivaceus*, GILL (1862), l. c. 43; (1876), Rept. Ichthy. Capt. Simpson's Exp. 417.—JORDAN (1876), Man. Vert. 300.—JORDAN & COPELAND (1876), Check List, 159.
- Synechoglanis beadleii*, GILL (1859), Trans. Lye. Nat. Hist. N. Y. 2 (reprint).
- Ictalurus beadleii*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43.—JORDAN & COPELAND (1876), Check List, 159.
- Pimelodus houghii*, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.
- Pimelodus megalops*, GIRARD (1859), l. c. 161 (said to have the eye very large, its diameter one-third the length of the side of the head).
- Ictalurus megalops*, JORDAN & COPELAND (1876), Bull. Buff. Soc. Nat. Hist. 159.
- Pimelodus graciosus*, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 161.
- Pimelodus hammondi*, ABBOTT (1860), Proc. Acad. Nat. Sci. Phila. 568.
- Pimelodus notatus*, ABBOTT (1860), Proc. Acad. Nat. Sci. Phila. 569.
- Ictalurus simpsoni*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 43; (1876), Ich. Capt. Simpson's Exp. 417.

Habitat.—Northern New York; Canada. Great Lake Region, throughout Mississippi Valley, Nebraska, Kansas, to Georgia, Florida, and Texas.

The synonymy of this species is not altogether creditable to workers in American ichthyology. It is one of our most abundant and widely diffused fishes, and one even less subject to variations than species of such wide distribution usually are. And yet, if the above synonymy is correct, we have twenty-three different specific and varietal names applied to it. It would seem as if every naturalist who had obtained a Channel Cat was sure that such a Cat-fish, so slender, so clean, and so white, must surely be unknown to science, or else he would have heard of it before. As a result of this, nearly every writer on American fresh-water fishes has one or more nominal species based on some

stage in the growth of the *Ichthælorus punctatus*, or on some real or imagined variation of it.

The specific name *cærulescens* has been the one most generally employed, although, as will be seen from the above synonymy, eight different specific and varietal names have priority over it. The oldest description is apparently that of Rafinesque under the name of *Silurus punctatus*. The specific name of *punctatus* is accordingly the one to be employed. The other Rafinesquian names evidently apply to different stages in the growth of the species. Rafinesque's *P. cærulescens*, however, as well as that of Dr. Kirtland and others, includes *Amiurus nigricans*. This error has been the source of much confusion; the great Mississippi Cat-fish having been wrongly supposed to be an *Ichthælorus*. I find nothing in the accounts given of *fuscifer* and *caudafuscatus* to indicate that they were founded on species distinct from *punctatus*. *I. gracilis* Hough (= *houghii* Grd.) is said to have a less number of anal rays than has been noticed in *punctatus*. Hough's specimens were from Northern New York. I have examined specimens from Saint Lawrence County, New York, presumably referable to *gracilis*, but they have 27 anal rays, and, so far as I can see, are precisely like the ordinary *punctatus*, except that the serrations of the pectoral spine are perhaps a trifle weaker. An examination of the types of *beadlei*, *simpsoni*, *olivaceus*, and *vulpes* shows nothing of specific value. The number of anal rays is 25 to 28 in them all, as in typical *punctatus*. *Olivaceus* appears rather more slender than is usual. *Notatus* and *hammondi* are rather indifferently described, but there is nothing in the description of either to show that it does not belong here. The types of *graciosus* and *megalops* have a rather longer anal fin than usual, and differ slightly in form. I have seen other specimens like them, but am unable to recognize even a variety. Girard's statement of the size of the eye in *megalops* is exaggerated.

4. ICHTHÆLURUS MERIDIONALIS, (Günther) Jordan.

Southern Channel Cat.

(Figs. 7 and 8.)

Amiurus meridionalis, GÜNTHER (1864), Cat. Fishes Brit. Mus. v, 102; (1868), Trans. Zool. Soc. London, 473.

I infer, from the figure only, that this species belongs to *Ichthælorus* rather than to *Amiurus*. Although the distinctive characters of the two genera were made known in 1862, in the description of this species we find no allusion to those characters, and no attempt at comparison

of the species with those previously known. So far as I can judge from the figure, this species is an affine of *I. robustus*, having, like that species, the eye anterior and the number of anal rays intermediate (28 or 29), but differing in the greater slenderness of the body.

GENUS AMIURUS, (*Rafinesque*) *Gill*.

Silurus et *Pimelodus* sp., LINNÆUS, and all writers prior to 1862.

Ameiurus, RAFINESQUE (1820), Ich. Ohiensis, 65 (as section under subgenus *Ictalurus* of *Pimelodus*).

Amiurus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 50, and of recent writers generally.

Ameiurus, COPE (1864), Proc. Acad. Nat. Sci. Phila. 231.

Gronias, * COPE (1864), Proc. Acad. Nat. Sci. Phila. 231 (*G. nigrilabris*).

ETYMOLOGY.—*a*, privitive; *μειωρος*, curtailed, in allusion to the entire caudal fin.

TYPE.—*Silurus cupreus* Rafinesque.

Body moderately elongated, robust, anteriorly vertically ovate, and scarcely compressed; caudal peduncle also robust, but much compressed, and at its end evenly convex.

Head large, wide, laterally expanded, above ovate and in profile cuneiform; supraoccipital extended little posteriorly and terminating in a more or less acute point, which is entirely separate from the second interspinal buckler; the skin covering the bones is thick.

Eyes rather small, in one species covered by the skin; mouth large, terminal, transverse, the upper jaw in most species the longer; jaws often equal, the lower in one or two species distinctly projecting.

Teeth subulate, aggregated in broad bands on the intermaxillaries and dentaries; the intermaxillary band is convex in front, of equal breadth, and abruptly truncated near the insertion of the intermaxillaries; the lower dental band is anteriorly semicircular, attenuated to the angles of the mouth.

Branchiostegal membrane on each side with eight or nine rays in typical species, ten or eleven in two or three aberrant species; dorsal situated over the interval between the pectorals and ventrals, higher than long, with a pungent spinous ray dentate behind, and about six branched rays; adipose fin short, inserted over the posterior half of the anal; anal fin of moderate length, with from fifteen to twenty-six rays, the usual number being twenty or twenty-one; caudal fin short, usually truncate when spread open, slightly emarginate when not expanded,—in species related to *Ichthaelurus* more or less deeply forked, in some other species rounded; when the caudal fin is forked the lobes are usually un-

* Prof. Cope thus defines this genus:—"Head broad, depressed; supraoccipital bone posteriorly free; branchiostegal membrane with ten rays; anterior dorsal spine stout; posterior (adipose) fin separated from caudal; ventrals with eight rays; eyes rudimental, covered by the corium; natatory bladder present."

equal; ventrals each with one simple and seven branched rays; pectoral fins each with a stout spine, which is commonly retrorse-serrate behind; these serræ vary much with age and circumstances, and do not appear in this genus to furnish good specific characters; lateral line usually incomplete.

This genus includes our common Eastern American Catfishes, and is readily recognized by the broad head covered by a thick skin, the free termination of the posterior process of the supraoccipital bone, the compressed body, and by the free adipose fin.

This genus, although undoubtedly a very natural one, is rather hard to define. Certain species (*lupus*, *niveiventris*, *nigricans*) have real affinities with the species of *Ichthelurus*, having, like them, the body elongate, the head rather narrow, the anal long, the caudal forked, and the coloration pale. The absence of the connection between the supraoccipital and the interspinal is the only technical character by which *Amiurus* may be distinguished from *Ichthelurus*.

ANALYSIS OF SPECIES.

- *. Caudal fin forked; upper jaw longest; dorsal beginning nearer snout than adipose fin; colors blackish-silvery :
 - t. Anal fin elongate, of 23 to 28 rays :
 - a. Caudal fin deeply furcate; head narrow, longer than broad; anal rays 23 or 24; pectoral spines long and slender, dentate; barbels long; depth about 5 in length; width of head $4\frac{1}{2}$; body rather slender :
 - . Head narrowed, its width being less than its length above; distance from snout to dorsal spine $1\frac{1}{2}$ to $1\frac{1}{4}$ in distance from dorsal spine to adipose fin; base of anal as long as head *LUPUS*, 5.
 - . Head broader, its width equal to its length above; distance to dorsal spine $1\frac{1}{2}$ in distance from spine to adipose fin; base of anal notably less than head *NIVEIVENTRIS*, 6.
 - aa. Caudal fin strongly furcate; head $4\frac{1}{2}$ in length, its width 5; anal rays 25 or 26; pectoral spines dentate, short, and stout; barbels long; body rather stout, color dark, often mottled with pale; size very large *NIGRICANS*, 7.
 - aaa. Caudal fin shallow-furcate; pectoral spine not serrate; head broad, as wide as long *BOREALIS*, 8.
 - tt. Anal fin short and rather low, of 19 to 22 rays; adipose fin very large; humera process strongly rugose; colors pale, more or less silvery :
 - b. Head narrower, longer than wide, its width 4 to 6 times in length; mouth narrow; upper jaw much projecting; eye large, 3 to 5 in interorbital width; barbels long, except nasal barbel; lateral line almost complete; caudal fin more deeply forked; anal fin $4\frac{1}{2}$ to 5 in length; dorsal about midway between adipose fin and snout *ALBIDUS*, 9.
 - bb. Head very broad, as wide as long, its width $3\frac{1}{4}$ in length of body; eye 5 to 6 in interorbital width; caudal not deeply forked; anal fin $5\frac{1}{2}$ to 6 in length; mouth wider than in any other species; jaws nearly equal; dorsal much nearer adipose fin than snout; colors pale, somewhat silvery, especially on head *LOPIUS*, 10.

- **. Caudal fin not forked, rounded or usually somewhat emarginate, nearly truncate when spread open :
- †. Body moderately elongate, depth one-fifth or more of length; branchiostegals normally 9 or 10 :
- c. Anal fin very long, its base one-fourth or more of length of body, of 24 to 26 rays; dorsal spine normally nearer snout than adipose fin :
- Head and body elongated; the dorsal region considerably elevated; the head quite long and narrowed forwards; much longer than broad; its width in front of eye only about half its length; mouth rather narrow, with equal jaws; barbels long; adipose fin large; spines strong; dorsal fin very high; anal fin long and deep; caudal fin short; color dark *EREENNUS*, 11.
- — Head wide and flattish, not much longer than broad; rounded in front; the mouth very wide; the dorsal region not much elevated; body more or less stout and thick; branchiostegals 8 or 9, jaws equal or upper jaw longest *NATALIS*, 12
- w. Dorsal considerably nearer snout than adipose fin :
- x. Jaws equal; spines very short; anal rays 25; colors yellowish-brown, *Liridus*, b.
- xx. Upper jaw distinctly longest :
- y. Anal rays 24 or 25, its rays less than half head, its base $3\frac{1}{2}$ in length of body; the nape not swollen :
- z. Colors pale; yellowish-brown *Cupreus*, c.
- zz. Colors dark; black or greenish *Canus*, d.
- yy. Anal rays 26; base of anal $3\frac{1}{2}$ in length, its rays short, less than half length of head; spines weak; head $3\frac{1}{2}$ to $3\frac{3}{4}$ in length; distance to dorsal spine $2\frac{3}{4}$ to $2\frac{1}{2}$; the nape more or less swollen and elevated *Antoniensis*, e.
- yyy. Anal rays 27, its base elongate, $3\frac{1}{2}$ in length, its longest rays more than half head; spines strong; head short, 4 in length, the distance to dorsal nearly 3; nape not swollen *Analus*, f.
- ww. Dorsal rather nearer adipose fin than snout; the posterior part of the body being much thicker and proportionally shortened; the caudal fin short; dorsal and ventral outlines nearly parallel; jaws about equal *Natalis*, a.
- cc. Anal fin moderate, of 19 to 22 rays; branchiostegals normally 8 or 9 :
- d. Lower jaw distinctly longest; anal rays 20 :
- e. Body moderately elongate, depth $4\frac{1}{2}$ to 5 in length; head $3\frac{1}{2}$ to 4; barbel long; mouth wide; head longer than broad, rather narrowed forward; profile rather steep, pretty evenly convex; dorsal region more or less elevated; dorsal spine nearer snout than adipose fin; lower jaw strongly projecting; color blackish (varying in subspecies *alurus* to head blunter and flatter above; dorsal spine rather nearer adipose fin) *VULGARIS*, 13.
- dd. Jaws equal, or upper jaw projecting beyond lower :
- f. Eyes distinct, well developed :
- g. Head moderately broad, a nearly even slope from the tip of the snout to the elevated base of the dorsal :
- Body sharply mottled with brown, greenish, and whitish; the coloration therefore singular among Catfishes; jaws equal or nearly so; depth about 4 in length; slope of profile very steep; dorsal fin high; the spine more than half length of head; dorsal spine nearer adipose fin than snout; barbels long; branchiostegals 10; head $3\frac{1}{2}$ in length *MARMORATUS*, 14.

—. Body nearly uniform in color above, or slightly mottled or clouded:

h. Body rather elongate; depth 4 to $4\frac{1}{2}$ in length; head broader than in the next, the front less steep, but the slope from snout to dorsal more uniform; body less rapidly narrowed behind; anal fin longer; its base $4\frac{1}{2}$ in body, the rays usually 21 or 22; dorsal usually rather nearer adipose fin than snout; the upper jaw more elongate; color dark yellowish-brown, varying to dusky or even to black, sometimes more or less clouded CATUS, 15.

hh. Body very short, stout, and deep, the depth $3\frac{1}{2}$ to 4 in length; head moderate, somewhat contracted forward; the front steeply elevated, the body thick across the shoulders, rather rapidly narrowed behind; anal fin short and deep, of 18 to 20 rays, its base nearly 5 in length of body; dorsal nearer adipose fin than snout; jaws nearly equal; size small; color almost black; form varying to extremely short and thick, especially behind, with short caudal fin MELAS, 16.

gg. Head very broad, the slope from snout to base of dorsal quite uneven, there being a more or less decided angle at occiput; head about as broad as long, its length about 4 in body; dorsal spine nearer adipose fin than snout, its rays usually 19 (rarely 18 or 20); body short and stout; mouth very broad; color rather pale, chiefly uniform yellowish-brown, varying to dark brown or pale yellow; head sometimes yellow (*Raf.*); belly yellow; size small XANTHOCEPHALUS, 17.

ff. Eyes more or less rudimentary and concealed beneath the skin; jaws equal; muzzle flat; dorsal spine midway between snout and middle of adipose fin; barbels short; caudal slightly emarginate; anal with 18 rays; color blackish above; jaws and fins black; sides varied with yellowish; belly pale; branchiostegals 10 NIGRILABRIS, 18.

ccc. Anal fin few-rayed (rays 15 to 17):

i. Upper jaw distinctly longest:

j. Body short and stout; depth about 4 in length; head flattened, nearly as broad as long; dorsal nearer adipose fin than snout; mouth large; spines moderately serrate; colors very dark, almost black PULLUS, 19.

jj. Body slender, elongate, the depth about $5\frac{1}{2}$ in length; head roundish, rather long, about 4 in length, the width $4\frac{1}{2}$; mouth small; the upper jaw more projecting than in any other of the species known; profile convex, not steep; dorsal fin very high, $\frac{3}{4}$ length of head, well forward, its spine nearer snout than adipose fin; anal fin short and high, its base 5 in length of body; pectoral spine serrated; color pale olive-brown; a blackish horizontal bar at base of dorsal BRUNNEUS, 20.

††. Body excessively slender, elongate, as in *Pelodichthys*, the depth being 6 to 8 times in length of body; head broad and flat, nearly as wide as long; anal fin with 20 rays; the base of the fin $4\frac{1}{2}$ to 5 in body; jaws equal; branchiostegals 11; mouth very wide; dorsal spine nearer snout than adipose fin; coloration ordinary, a blackish horizontal bar at base of dorsal,

PLATYCEPHALUS, 21

5. AMIURUS LUPUS, (Girard) Günther.

Texas Cat.

(Figs. 9 and 10.)

Pimelodus lupus, GIRARD (1858), U. S. Pac. R. R. Expl. x, 211.

Amiurus lupus, GÜNTHER (1864), Cat. Fishes Brit. Mus. v., 101.

Habitat.—Streams of Texas.

This species strongly resembles *Ichthaelurus punctatus*, but differs in the shorter body, wider mouth, and darker colors, as well as in the generic character of the free supraoccipital. In this species, however, there intervenes scarcely more than the diameter of a pin's head between the supraoccipital and the interspinal, in specimens 8 inches long; so nearly connected are they that I was at first disposed to consider this species as an *Ichthaelurus*. Numerous specimens of *A. lupus* are in the museum from Texas.

6. AMIURUS NIVEIVENTRIS, Cope.

White-bellied Cat.

(Figs. 11 and 12.)

Amiurus niveiventris, COPE (1870), Proc. Am. Philos. Soc. 486; JORDAN & COPELAND (1876), Check List, 159.

Habitat.—Neuse River, North Carolina.

This species seems to be very close to *A. lupus*, but appears to differ in the broader head and in some other features. I have seen no specimens of it.

7. AMIURUS NIGRICANS, (Le Sueur) Gill.

Great Fork-tailed Cat—Mississippi Cat.—Florida Cat.

(Figs. 13 and 14.)

Pimelodus nigricans, LE SUEUR (1819), Mémoires du Muséum d'Hist. Nat. v, 153.—CUV. & VAL. (1840), xv, 133.—DE KAY (1842), Fishes N. Y. 180.—STORER (1846), Synopsis, 403.—“HYRTL (1859), Denkschrift Akad. Wiss. Wien, xvi, 16.”

Amiurus nigricans, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—JORDAN (1876), Man. Vert. 318.—JORDAN & COPELAND (1876), Check List, 159 (not of GÜNTHER (1864) nor of COPE (1870) = *A. canosus*).

Silurus (Pimelodus) nigrescens, RICHARDSON (1836), Fauna Bor.-Am. Fishes, 134.

Pimelodus sp. incog., THOMPSON (1842), History Vermont, 139.

Pimelodus coeruleus, in part of RAFINESQUE, KIRKLAND, and others; the big “Channel Cats” all belong to this species.

Habitat.—Great Lakes and Mississippi River, ascending all the larger tributaries, larger rivers of the South Atlantic and Gulf States generally.

This species is the "Great Fork-tailed Cat" of the Lakes and the "Great Mississippi Cat" of the Mississippi and Ohio Rivers. I have seen and identified specimens of thirty to forty pounds weight, and have seen specimens which I suppose were of this species which weighed nearly a hundred pounds. I have heard of Catfish weighing two or three hundred pounds, but have never seen them, and presume they were "weighed by guess". This species undoubtedly attains the largest size of any of our representatives of the family. Specimens of this species of a large size are in the United States National Museum, from St. John's River, Florida. They appear to have a rather steeper front than the northern ones, but are otherwise similar.

As indicated above, the "*A. nigricans*" of Dr. Günther is probably the *cænosus*, as the present species has the caudal fin strongly forked.

8. AMIURUS BOREALIS, (*Richardson*) *Gill*.

The Mathemeg or Land Cod.

Pimelodus borealis, RICHARDSON (1836), Fauna Boreali-Americana, Fishes, 135.—CUV. & VAL. (1840), xv, 130.—STORER (1846), Synopsis, 402.

Amiurus borealis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—GÜNTHER (1864), Cat. Fishes, v, 100.—COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN & COPELAND, Check List, 159.

Habitat.—British America.

I do not know this species, and it may not really have a forked caudal fin. It is not improbable that its relations are with *Amiurus cænosus* rather than with *A. nigricans*.

9. AMIURUS ALBIDUS, (*Le Sueur*) *Gill*.

Eastern Fork-tailed Cat—"Channel Cat" of the Potomac.

(Figs. 15 and 16.)

Pimelodus albidus, LE SUEUR (1819), Mém. du Mus. d'Histoire Nat. v, 148.—CUV. & VAL. (1840), xv, 131.

Amiurus albidus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.

Pimelodus nebulosus, CUV. & VAL. (1840), xv, 132 (in part; not of Le Sueur).

Amiurus nebulosus, GÜNTHER (1864), Cat. Fishes, v, 101.

Pimelodus lynx, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 160.

Amiurus lynx, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 485.—UHLER & LUGGER (1876), Fishes Maryland, 152.—JORDAN (1876), Man. Vert. 300.—JORDAN & COPELAND (1876), Check List, 160.

Ictalurus macaskyei, STAUFFER (1869), Mombert's History Lancaster Co. Pa. 578.

Ictalurus keviniskii, STAUFFER (1869), Mombert's History Lancaster Co. Pa. 578.

Habitat.—Atlantic streams, Pennsylvania to North Carolina.

The *Pimelodus albidus* of Le Sueur* seems to me rather to have been

* Le Sueur says: "Tête large, aplatie; * * couleur d'un blanc cendré * * * caudale très légèrement échancrée," characters evidently belonging to the *lynx* rather than to the *catus*. This is the more plain, as in describing the distinctly fork-tailed

based on this species than on an albino of *catus*, as supposed by Prof. Cope. I have therefore substituted the appropriate name *albidus* for the unmeaning *lynx*. This is an extremely variable species. Old specimens bear a strong resemblance to the next species, while the young are quite slender.

10. AMIURUS LOPHIUS, Cope.

Big-mouthed Cat.

(Figs. 17 and 18.)

Amiurus lophius, COPE (1870), Proc. Am. Philos. Soc. 4:6.—JORDAN (1876), Manual Vert. 301.—JORDAN & COPELAND (1876), Check List, 160.

Habitat.—Streams tributary to Chesapeake Bay. *A. lophius* is a common fish in the Washington markets.

The synonymy of this species requires no special remark.

11. AMIURUS EREBENNUS, (Jordan) sp. nov.

Goode's Cat.

(Figs. 19 and 20.)

Habitat.—St. John's River, Florida.

This species is related to *A. nigricans* and others of the fork-tailed group, but has the truncate caudal fin of *A. lividus*.

Body rather elongate, compressed, the depth about $4\frac{1}{3}$ in length; dorsal region rather elevated, the head quite long and narrowed forward, 4 times in length of body. The head is more narrowed than in any of the other species except *A. lupus*. The width of the head in front of the eye is but little more than half its length. The width of the mouth is about half the length of the head. The greatest width of the head is contained about $1\frac{1}{3}$ times in its length. The dorsal fin is slightly nearer the snout than the adipose fin.

The dorsal fin is unusually high, its spine is long, as in the species of *Ichthælorus*. The pectoral spine is very strong and it is about half as long as the head. The anal fin is long and deep. It is nearly one-fourth the length of the body, and is composed of 24 rays. The adipose fin is large. The caudal fin is rather short and is truncate behind.

The jaws are equal. The supraoccipital bone is but little free behind. The branchial apertures are rather more restricted than usual.

nigricans, Le Sueur says, "caudale légèrement échancrée en croissant." It seems that Prof. Gill had some time since independently reached a similar conclusion, and that the "*Amiurus lynx*" has been for some time correctly known as *A. albidus* by the members of the Fish Commission.

Color very dark. The type-specimen is quite black, both body and fins; the belly is pale, but the lower barbels as well as the upper ones are black.

The type was collected in the St. John's River, Florida, by Mr. G. Brown Goode. It is a little more than a foot long.

This species is intermediate between *A. lupus* and *A. lividus*, having the narrowed head, high dorsal, and small mouth of the first, with the short, truncate caudal fin of the second.

12. AMIURUS NATALIS, (*Le Sueur*) Gill.

Catfish—Yellow Cat.

a. Subspecies NATALIS.

(Figs. 21 and 22.)

Pimelodus natalis, LE SUEUR (1819), Mém. du Muséum, v, 154—STORER (1846), Synopsis, 405.

Amiurus natalis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44—GÜNTHER (1864), Cat. Fishes Brit. Mus. v, 101.

Pimelodus puma, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 160.

Habitat.—Great Lakes to North Carolina and south.

b. Subspecies LIVIDUS, Raf.

(Figs. 23 and 24.)

Silurus lividus, RAFINESQUE (1820), Quart. Journ. Sci. Lit. Arts, London, 48 (et var. *fuscatus*).

Pimelodus lividus, RAFINESQUE (1820), Ich. Ohiensis, 65.

Amiurus lividus, JORDAN (1876), Man. Vert. 302.—JORDAN & COPELAND (1876), Check List, 159.

Pimelodus felinus, GIRARD (1858), U. S. Pac. R. R. Expl. x, 209.

Amiurus felinus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN & COPELAND (1876), Check List, 159.

Pimelodus catus, GRD. (1859), Proc. Phila. Acad. Nat. Sci. 160 (not of De Kay and most authors).

Amiurus catus, COPE (1870), Proc. Am. Philos. Soc. 484.—JORDAN & COPELAND, Check List, 159.

Pimelodus cupreoides, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.

Amiurus cupreoides, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.

Habitat.—Ohio Valley to Arkansas. North Carolina and south.

c. Subspecies CÆNOSUS, (*Richardson*) Gill.

(Figs. 25 and 26.)

Silurus (Pimelodus) cænosus, RICHARDSON (1836), Fauna Bor.-Amer. Fishes, 132.—CUV. & VALENTIN (1840), xv, 129.—DE KAY (1842), Fishes N. Y. 186.—STORER (1846), Synopsis, 402.

Amiurus cænosus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), l. c. 485. JORDAN (1876), Man. Vert. 303.—JORDAN & COPELAND, Check List, 159.

Habitat.—Maine to Great Lakes and northward.

d. Subspecies CUPREUS, (Raf.) Gill.

(Figs. 27 and 28.)

Silurus cupreus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, London, 51.*Pimelodus (Amiurus) cupreus*, RAFINESQUE (1820), Ich. Oh. 65.*Pimelodus cupreus*, KIRTLAND (1838), Rept. Zool. Ohio, 169, 194; (1846), Bost. Journ. Nat. Hist. iv, 333.—DE KAY (1842), Fishes N. Y. 187.—STORER (1846), Synopsis, 404.—GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.*Amiurus cupreus*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Phil. Soc. 485.—JORDAN (1876), Bull. Buff. Soc. Nat. Hist. 96; (1876), Man. Vert. 303.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN & COPELAND (1876), Check List, 159.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN (1877), Annals Lycæum Nat. Hist. N. Y. —.—JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 45.*Amiurus cupreus*, COPE (1865), Proc. Acad. Nat. Sci. Phila. 276.*Habitat*.—Ohio Valley, Mississippi Valley, and south.

e. Subspecies ANTONIENSIS, (Grd.) Gill.

(Figs. 29 and 30.)

Pimelodus antoniensis, GIRARD (1859), Pac. R. R. Expl. x, 291.*Amiurus antoniensis*, GILL (1862), l. c. 44.—COPE (1870), l. c. 435.*Habitat*.—Georgia to Texas.

f. Subspecies ANALIS, Jordan.

(Figs. 31 and 32.)

Habitat.—Arkansas River.

I have hitherto followed Girard in identifying this species with *Silurus catus* of Linnæus, but a glance at the original description is sufficient to show the error of such an identification. The first name in order of time which seems to have been given to this species is that of *Pimelodus natalis* Le Sueur, but the best of the early descriptions is that of Rafinesque as *Pimelodus lividus*.

The original description of *cupreus* is incorrect in ascribing 15 anal rays instead of 25. This is probably a misprint. The form or subspecies here indicated as *cupreus* is the one most widely diffused. The type of Girard's *catus* differs only from specimens labelled (by him?) *cupreus* in having the jaws equal. The form called *cænosus* seems to differ chiefly in coloration; this species, like most others, being of a much darker color in the Northern Lakes.

A. antoniensis Grd. is also slightly different in form. The specimens obtained by me in the Etowah River, Georgia, I refer to *antoniensis*. They are short in body, with a swollen nape and a rather longer anal fin.

Specimens from Little Red River, Arkansas, collected by Prof. H. S.

Reynolds, with an extremely long anal fin and some peculiarities of form, I have termed var. *analis*.

The description of *Pimelodus natalis* Le Sueur appears to have been based on an individual with the caudal peduncle swollen and elevated.

It appears that most of the species have what may be termed "*natalis*" forms, *i. e.*, individuals with the post dorsal region shortened and thickened, with the adipose fin enlarged, and with the caudal fin very short; owing to the encroachment of the flesh on its rays. These forms often appear more distinct from the normal type than do any two allied species. The names *puma* and *natalis* seem to have been based on the *natalis* type of this species. *Catulus* and *confinis* are the *natalis* form of *melas*, and so on. Whether these peculiar forms are distinct races or aberrant individuals, or stages in the life of an individual, or what they are, I have not now sufficient evidence to enable me to decide. I can only say that I do not at present consider them distinct *species*.

13. AMIURUS VULGARIS, (Thompson) Nelson.

Long-jawed Catfish.

a. Subspecies VULGARIS.

(Figs. 33 and 34.)

Pimelodus vulgaris, THOMPSON (1842), History of Vermont 138.

Amiurus vulgaris, NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN & COPELAND (1876), Check List, 159.

Pimelodus dekayi, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 160.

Amiurus dekayi, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN (1876), Man. Vert. 302.

Habitat.—Lake Champlain and Great Lake region.

b. Subspecies ÆLURUS, (Girard) Gill.

(Fig. 35.)

Pimelodus ælurus, GIRARD (1858), U. S. Pac. R. R. Surv. Fishes, 210.

Amiurus ælurus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.

Amiurus ælurus, COPE (1870), Proc. Am. Philos. Soc. 485.—JORDAN (1876), Man. Vert. 302.—JORDAN & COPELAND (1877), Check List, 159.

Habitat.—Upper Mississippi River, Missouri River and their tributaries, also in Red River of the North.

Girard's statement that his *dekayi* is the same as De Kay's *Pimelodus catus* is certainly incorrect, if any reliance is to be placed on descriptions. That Thompson's *vulgaris* is the same as *dekayi* I have no doubt. *Amiurus ælurus*, of which I have examined the types as well as numer-

ous specimens from the Red River of the North, from the Mississippi River at Saint Louis, and from the Illinois River, differs somewhat in proportions; but I think it specifically identical with *A. vulgaris* from Lake Erie.

14. AMIURUS MARMORATUS, (*Holbrook*) *Jordan*.

Marbled Catfish.

(Figs. 36 and 37.)

Pimelodus marmoratus, HOLBROOK (1855), Journ. Acad. Nat. Sci. Phila. 51.

Habitat.—Georgia to Florida.

This beautiful and singular species seems to have been overlooked by all writers since the original description. The characters given in the preceding analysis are taken from a specimen sent by Dr. Holbrook to the United States National Museum. It differs from *catus* chiefly in the coloration. I have been informed that similarly colored Catfishes occur in Pennsylvania, and I have seen a crayon sketch of one such by Mr. J. H. Richard.

15. AMIURUS MELAS, (*Rafinesque*) *Jordan & Copeland*.

Small Black Catfish.

(Figs 38 and 39.)

Silurus melas, RAFINESQUE (1820), Quart. Journ. Sci. Lit. Arts, London, 51.

Pimelodus melas, RAFINESQUE (1820), Ichthyologia Ohiensis, 66.

Amiurus melas, JORDAN & COPELAND (1876), Check List, 159.

Pimelodus catulus, GIRARD (1858), U. S. Pac. R. R. Surv. 203.

Amiurus catulus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc.

Am. Philos. Soc. 485.—JORDAN & COPELAND (1876), Check List, 159.

Pimelodus confinis, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.

Amiurus confinis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc.

Am. Philos. Soc. 486.—JORDAN (1876), Man. Vert. 301.—NELSON (1876), Bull.

Ills. Mus. Nat. Hist. 50.—JORDAN & COPELAND (1876), Check List, 159.

Amiurus obesus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—JORDAN & COPELAND (1876), Check List, 159.—GILL (1876), Ich. Capt. Simpson's Explorations, 420.

Amiurus nebulosus, COPE & YARROW (1876), Zool. Lieut. Wheeler's Surv. West of 100th Meridian, v, 640 (excl. syn.).

Amiurus pullus, NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50 (not *P. pullus* De K.).

This species occurs abundantly throughout the Mississippi Valley, replacing the allied species *catus*. Prof. Cope considers it a variety of *catus*; but the short deep body and small anal fin thus far have served to distinguish it. The coloration of the anal fin is somewhat characteristic. The membrane is unusually black and contrasts with the pale rays.

Girard's types of *confinis* and *catulus* appear to be the shortened or

natalis form of this species. There is certainly nothing in the emargination of the caudal fin in which *confinis* and *hoyi* differ from the rest of the species with the caudal fin truncate, as has been supposed by Prof. Cope, on the strength of Girard's description.

The only good description of this species is that of Prof. Gill, under the name of *Amiurus obesus*, in the report of Captain Simpson's Explorations. I have no doubt of the identity of Rafinesque's *melas* with the *obesus*. The *obesus* occurs in considerable abundance about the Falls of the Ohio, and Rafinesque's description is reasonably accurate.

16. AMIURUS CATUS, (L.) Gill.

Bullhead—Hornpout—Catfish.

(Figs. 40 and 41.)

- ?*Bagre fecunda* species *Maregr. affinis*, CATESBY (1750), Fishes etc. Carolina, 23, tab. xxiii (a most wretched figure, absolutely unidentifiable).
Silurus catus, LINN. (1758), Syst. Nat. x, p. 305; (1766), xii, p. 504.—BLOCH. SCHN. (1801), 387.—MITCHILL (1818), Journal Lit. & Philos. Soc. N. Y. i, 433.
Pimelodus catus, CUV. & VAL. (1840), xv, 124.—DE KAY (1842), Fishes N. Y. 182.—STORER (1846), Synopsis, 402.
Amiurus catus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—GÜNTHER (1864), Cat. Fishes, v, 99 (excl. syn. pars).—UHLER & LUGGER (1876), Fishes of Maryland, 152.
Pimelodus nebulosus, LE SUEUR (1819), Mém. de Muséum, v, 149.—STORER (1838), Rept. Fishes Mass. 102.
Amiurus nebulosus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 435.
Pimelodus atrarius, DE KAY (1842), Fishes N. Y. 185.—STORER (1846), Synopsis, 404; (1855), Fishes of Mass. 279.
Amiurus atrarius, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—JORDAN (1876), Man. Vert. 30.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN & COPELAND (1876), Check List, 159.—JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 46.
Pimelodus felis, AGASSIZ (1850), Lake Superior, 231.
Amiurus felis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.
Pimelodus hoyi, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 159.
Amiurus hoyi, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc. Am. Philos. Soc. 486.—JORDAN (1876), Man. Vert. 301.—JORDAN & COPELAND (1876), Check List, 159.
Pimelodus vulpeculus, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 160.
Amiurus vulpeculus, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.

Variety? MISPELLIENSIS.

Amiurus mississippiensis, COPE (1870), Proc. Am. Philos. Soc. 486.—JORDAN & COPELAND (1876), Check List, 159.

Habitat.—Great Lake Region and Upper Mississippi to Arkansas and northward; also in streams of the Atlantic States from Maine south to Carolina.

I have restored the name of *catus** to this species, following in this respect Valenciennes and the older American authors rather than Girard, who transferred the name to an entirely different species. The fact that Linnæus counted twenty anal rays renders it unlikely that he had a specimen of *lividus*, a species with twenty-five anal rays before him. As it is not possible to say with certainty what species he did have, we must adopt Valenciennes's identification of it until it is shown that it is probably erroneous. The following is Linnæus's description (*Systema Naturæ*, xii, 504):—

Catus 12. S. pinna dorsali postica adiposa, ani radiis 20. Cirris 8. B. 5, D $\frac{1}{2}$, O. P $\frac{1}{4}$ V. 8, A. 20. C. 17.

Catesb. car. 2. p. 23. t. 23. Bagre 2. *Maregr.* affinis.

Maregr. bras. 173. Bagro species, 2.

Habitat in America, Asia.

Ex—Asia vidi pinnis ventr. radiis 6.

The species termed *atrarius*, *nebulosus*, and *catus* by the earlier authors are evidently identical.

There is nothing in the long description of *Pimelodus felis* to indicate that it is distinct from the common Lake Bullhead. In the elaborate enumeration of characters, individual and generic, given by Prof. Agassiz, nearly all that is specific seems to be lost.

On examination of the type-specimens of *Pimelodus hoyi* Grd., and *P. vulpeculus*, Girard, I am unable to see that they differ at all from this species. The caudal fin is not more emarginate than is usual in *catus*.

Amiurus mississippiensis Cope appears to differ in some respects; but these are probably individual peculiarities, as but one specimen seems to be known.

The best figure of this species is that given by Dr. Storer under the name of *Pimelodus atrarius*.

* In the twelfth edition of the *Systema Naturæ* (p. 503), Linnæus describes a *Silurus felis*, which has been considered a species of *Amiurus*. An examination of Linnæus's description has satisfied Prof. Gill and myself that *S. felis* was most probably based on *Arius milberti* C. & V. This latter species should then stand as *Ariopsis felis* (L.) Gill & Jordan.

The following is the original description :

Felis 10. S. pinna dorsali postica adiposa, ani radis 23 cirris 6, cauda bifida. B. 5, D $\frac{1}{2}$, O. P. $\frac{1}{4}$ V. 6, A. 23, C. 31.

Habitat in Carolina. *D. Garden.*

Cirri sub labio inferiore 4, supra sinus oris utrinque 1. Dorsum cærulescens. P. ventrales analisque rubescentes. Cauda bifida. Affinis *S. Cato*.

17. AMIURUS XANTHOCEPHALUS, (*Rafinesque*) Gill.

Small Yellow Catfish.

(Figs. 42 and 43.)

Silurus xanthocephalus, RAFF. (1820), Quart. Journ. Sci. Lit. Arts, London, 51.*Pimelodus xanthocephalus*, RAF. (1820), Ich. Ohiensis, 66.—KIRTLAND (1838), Rept. Zool. Ohio, 169, 194.—STORER (1846), Synopsis, 405.*Amiurus xanthocephalus*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—JORDAN & COPELAND (1876), Check List, 159.—JORDAN (1877), Ann. Lye. Nat. Hist. N. Y. —.*Pimelodus catus*, KIRTLAND Bost. Journ. Nat. Hist. v. 339. (excl. syn.).*Amiurus albidus*, JORDAN (1876), Man. Vert. 302 (not *Pimelodus albidus* Le Sueur).—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.*Amiurus nebulosus*, JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 45.*Habitat*.—Ohio Valley.

Rafinesque's description of this species is rather indifferent. Later writers seem to have overlooked the species altogether, or to have confounded it with *A. catus*. It is certainly quite distinct from *A. catus*, and apparently from all the others here mentioned. The peculiar profile, wide head, as well as the short and small anal fin, are characteristic. These points are fairly shown in Dr. Kirtland's otherwise bad figure of his *Pimelodus catus*.

18. AMIURUS NIGRILABRIS, (*Cope*) Gill & Jordan.

Blind Catfish.

(Figs. 44 and 45.)

Gronias nigrilabris, COPE (1864), Proc. Acad. Nat. Sci. Phila. 231.—JORDAN (1876), Man. Vert. 304.—JORDAN & COPELAND (1876), Check List, 160.*Amiurus nigrilabris*, GILL, MSS.

Habitat.—Cave streams tributary to the Conestoga River in Eastern Pennsylvania.

The concealed condition of the eyes in this species is not considered by Prof. Gill as a character of sufficient importance to warrant its generic separation.

A. nigrilabris is apparently descended from *A. pullus* or some similar species, its eyes being modified by its subterranean life.

19. AMIURUS PULLUS, (*De Kay*) Gill.

Black Bullhead of New York.

(Figs. 46 and 47.)

Pimelodus pullus, DE KAY (1842), Fishes N. Y. 184.—STOREY, Synopsis (1846), 404.*Amiurus pullus*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870), Proc.

Am. Philos. Soc. 485.—JORDAN (1876), Man. Vert. 301.—JORDAN & COPELAND (1876), Check List, 159.

Habitat.—Western New York to Northern New England.

This species resembles *A. catus*, but is distinguishable by the short anal fin. From *A. melas* the broader head and some other peculiarities separate it. It is possible, however, that it is a variety of the latter species.

20. AMIURUS BRUNNEUS, *Jordan*.

Small Brown Cat.

(Figs. 48 and 49.)

Amiurus brunneus, JORDAN (1876), Annals Lye. Nat. His. N. Y. —.*Habitat*.—Ocmulgee River, Georgia.

This species is one of the most strongly marked of the genus. It bears some resemblance to the species of *Noturus*.

21. AMIURUS PLATYCEPHALUS, (*Girard*) Gill.

Flat-headed Cat.

(Figs. 50 and 51.)

Pimelodus platycephalus, GIRARD (1859), Proc. Acad. Nat. Sci. Phila. 161.*Amiurus platycephalus*, GILL (1862), Proc. Bost. Soc. Nat. Hist. 44.—COPE (1870),

Proc. Am. Phil. Soc. 485.—JORDAN & COPELAND (1876), Check List, 159.

Habitat.—North Carolina to Georgia.

This species has the form of *Pelodichthys*, as well as the increased number of branchiostegals. The dorsal spine is, however, well developed, and the anal fin has the usual number of rays, although only 17 were counted by Prof. Cope. The lower jaw does not project, and the dentition is of the pattern usual in *Amiurus*.

GENUS PELODICHTHYS, (*Rafinesque*) Gill & Jordan.

Glanis, RAFINESQUE (1818), Am. Monthly Mag. & Crit. Review, 447 (named but not characterized).

Pilodictis, RAFINESQUE (1819), Prodrome de Soixante-dix Nouv. Genres &c. in Journal de Physique de Chymie et d'Histoire Naturelle Paris, 422.

Leptops, RAFINESQUE (1820), *Ichthyologia Ohiensis*, 64.

Opladelus, RAFINESQUE (1820), *Ichthyologia Ohiensis*, 64.

Hictis, RAFINESQUE (1820), *Ichthyologia Ohiensis*, 66.

Pyldictis, RAFINESQUE (1820), *Ichthyologia Ohiensis*, 67.

Hopladelus, GILL (1862), *Proc. Bost. Soc. Nat. Hist.* 45, and of most late authors.

Pelodichthys, GILL & JORDAN, MSS.—JORDAN (1876), *Ann. Lyc. Nat. Hist. N. Y.* —.

Pimelodus sp., KIRTLAND, CUV. & VAL. et Auct.

ETYMOLOGY.—*πηλος*, mud; *ιχθυς*, fish.

TYPE.—*Pilodictis limosus* Raf. = *Silurus olivaris* Raf.

Body much elongated, very slender, much depressed, anteriorly broader than high. Head large, very wide and depressed, latterly expanded, above broadly ovate, and in profile cuneiform. Skin very thick, entirely concealing the skull. Supraoccipital bone entirely free from the head of the second interspinal. Eyes small. Mouth very large, anterior and transverse. The lower jaw always projects beyond the upper. Teeth in broad villiform bands on the intermaxillaries and dentaries. The intermaxillary band is convex anteriorly, and proceeds to the insertion of the maxillaries, where it is abruptly angularly deflected, and proceeds backward as an elongated triangular extension. The band at the symphysis is slightly divided and anteriorly separated by a small triangular extension of the labial membrane. The lower dental is anteriorly semicircular and attenuated to the corners of the mouth. There are about twelve branchiostegal rays on each side.

The dorsal fin is situated over the posterior half of the interval between the pectorals and ventrals, and has a spine and about seven branched rays. The spine is rather small, and more or less enveloped in the thick skin.

The adipose fin is large, and has an elongated base resting over the posterior half of the anal; it is very obese and inclines rapidly backward; it is rather less free posteriorly than in *Amiurus*.

The anal fin is small; it commences far behind the anus, is a little longer than high, and is composed of about thirteen rays.

The caudal fin is oblong, subtruncated, placed on a vertical basis, and with numerous accessory simple rays, recurrent above and beneath the caudal peduncle.

The pectorals have a broad, compressed spine, serrated or dentated on its external and internal margins, and with the prolonged fleshy integument obliquely striated.

The ventrals are rounded and have nine rays, one simple and eight branched.

The anus is situated behind the ventrals, some distance behind their bases, and much in advance of the anal fin.

Coloration: brown or yellowish, more or less marbled or spotted.

The genus *Pelodichthys* is at first sight recognized by the long body, flat in front; the depressed and broad oblong head with the projecting lower jaw, by the posterior extension of the upper bands of teeth, by the partly concealed dorsal spine, the small size of the anal fin, and the recurrence of the caudal fin. But one species is definitely known. The various nominal species described by Rafinesque and Valenciennes, I think, were all based on the common *olivaris*.

Those who hold that the mere naming of a genus, without explanation or attempt at characterization, gives validity to such name, will call this genus *Glanis* instead of *Pelodichthys*.

ANALYSIS OF SPECIES.

*Body very long, slender, depressed forwards, closely compressed behind, the head extremely flat, the lower jaw longest; barbel short; dorsal spine small, half the height of the fin, enveloped in thick skin; pectoral spine very strong, flattened, serrate behind; caudal somewhat emarginate; anal short, its base about 7 in body, of 12 to 15 rays; premaxillary band of teeth with a large distinct backward process on each side; coloration mottled brown and yellowish, whitish below; size large,

OLIVARIS, 22.

22. PELODICHTHYS OLIVARIS, (*Rafinesque*) Gill & Jordan.

Mud Catfish.

(Figs. 52 and 53.)

Silurus olivaris, RAFINESQUE (1818), Am. Monthly Mag. iii, Sept. 355.

Hopladelus olivaris, GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—COPE (1869), Journ. Acad. Nat. Sci. Phila. 237.—JORDAN (1876), Man. Vert. 303.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—GILL (1876), Ich. Capt. Simpson's Expl. 426.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 46.

Pelodichthys olivaris, JORDAN (1877), Ann. Lye. Nat. Hist. N. Y. —.

Glanis limosus, RAF. (1818), Am. Monthly Mag. iii, 447, and iv, 107 (name only).

Pilodictis limosus, RAF. (1819), Journal de Physique, 422.

Pylodictis limosus, RAF. (1820), Ich. Ohiensis, 67.

Silurus nebulosus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, London, 50.

Pimelodus nebulosus, RAF. (1820), Ich. Oh. 64.

Silurus viscosus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, 50.

Pimelodus viscosus, RAF. (1820), Ich. Oh. 66.

Silurus limosus, RAF. (1820), Quart. Journ. Sci. Lit. Arts, 51.

Pimelodus limosus, RAF. (1820), Ich. Oh. 67.—KIRTLAND (1846), Bost. Journ. Nat. Hist. iv, 335.—STORER (1846), Synopsis, 404.

Pimelodus punctulatus, CUV. & VAL. (1840), xv, 134.—DE KAY (1842), Fishes N. Y. 187.—STORER (1846), Synopsis, 403.—GÜNTHER (1864), Cat. Fishes, v, —.

Pimelodus æneus, CUV. & VAL. (1840), xv, 135.—DE KAY (1842), l. c.—STORER (1846), l. c. 403.

Habitat.—Ohio Valley to Iowa and South.

GENUS NOTURUS, *Rafinesque*.

Noturus, RAF. (1818), Am. Monthly Mag. and Crit. Rev. iv, Nov. 41, and of most subsequent authors.

Schilbeodes, BLEEKER (1858), "Ichthyologiae Archipelagi Indici Prodromus, vol. i. Silnri (Acta Societatum Indo-Nederlandicae, vol. iv.) 258, (*S. gyrimus* Mit.)." (Also written *Schilbeoides*; I do not know which is the original orthography.)

ETYMOLOGY.—*νωτος*, back; *οψα*, tail ("means tail over the back", *Raf.*).

TYPE.—*Noturus flavus* Raf.

Body more or less elongate, anteriorly subcylindrical, thence more or less compressed.

Head above ovate and depressed, with a slight longitudinal furrow, branching into a transverse depression on the nape. Skin very thick, entirely concealing the bones. Supraoccipital entirely free from the head of the second interspinal. Eyes small or of moderate size. Mouth anterior, rather large, and transverse. Upper jaw usually more or less projecting beyond the lower. Teeth subulate, closely aggregated in a broad band in each jaw, which in the lower one is interrupted by a linear interval and in the upper one is continuous. The band in the upper jaw is either abruptly truncated at each end (subgenus *Schilbeodes*) or prolonged backward by a continuation from the postero-external angle (subgenus *Noturus*). The lower band is, as usual, attenuated toward the corners of the mouth. Branchiostegal membrane with nine rays on each side.

Dorsal fin situated over the posterior half of the interval between the pectoral and ventral fins, with a very pungent, short, edentulous spine and seven branched rays.

Adipose fin long and low, connected with the accessory rays of the caudal fin, and not forming a separate fin, never free behind; the membrane sometimes high and continuous, sometimes notched, in one species to the base.

Caudal fin very obliquely truncated or rounded, and inserted on an equally obliquely rounded base. The rays rapidly decrease in length inferiorly, and there are numerous rudimentary ones both above the caudal peduncle, where the anterior is united to the adipose fin, and forms a continuous keel (interrupted in one species), and below, where they advance considerably forward.

The anal fin is comparatively short, and rapidly increases in height for the first half of its length. It has from 12 to 20 rays.

The ventrals are rounded, and each has one simple and eight branched rays.

Pectoral fins with a sharp spine, either smooth, grooved, or dentate behind, the size and armature of the spine affording good specific characters.

The anus is situated some distance in advance of the anal fin.

The lateral line is complete.

The *Noturi* may be known at once by the peculiarities of the adipose and caudal fins. The genus is rather less homogeneous than any of the others.

Two subgeneric sections are recognizable:—

Noturus.—Size large; intermaxillary band of teeth with a backward process; pectoral spine nearly smooth within, sharply retrorse-serrate externally; a keel between dorsal and adipose fins.

Schilbeodes.—Size moderate or small; intermaxillary band of teeth without backward process; pectoral spine more nearly smooth externally, grooved or else serrate within; back not distinctly keeled.

ANALYSIS OF SPECIES.

- *. Premaxillary band of teeth with a strong backward process on each side (*Noturus*):
 - a. Body elongate; head depressed, broad, and flat, nearly as broad as long; middle region of body subcylindrical; tail compressed; head about $4\frac{1}{4}$ in length; width of head $5\frac{1}{8}$; depth $5\frac{3}{8}$ in length; distance to dorsal about 3 in length; barbels, short; a strong keel on back behind dorsal, leading to adipose fin; adipose fin deeply notched; dorsal spine very short, pectoral spine retrorsely serrate in front, slightly rough or nearly entire behind; its length three times in distance from snout to dorsal; anal rays about 16; color nearly uniform yellowish-brown, in northern specimens blackish above, slightly mottled; fins yellow-edged; size very large, reaches a length of more than a foot. FLAVUS, 23.
- ** Premaxillary band of teeth without lateral backward processes (*Schilbeodes*):
 - t. Pectoral spine dentate-serrate behind, more or less roughened in front; adipose fin notched:
 - b. Pectoral spines shortish, nearly straight, about one-third length of head; the serratures weak, less than half the diameter of the spine; body elongated its depth $5\frac{1}{2}$ to 7 in length; the head very much depressed; anal 14 to 17; colors nearly uniform, somewhat mottled; fins more or less dark-edged.
 - c. Pectoral spine retrorse-serrate without, weakly serrate within; head very broad, flat, and thin; upper jaw projecting; head about $4\frac{1}{4}$ in length, depth 6; dorsal fin one-fourth higher than long; distance from snout to dorsal about $2\frac{3}{4}$ in length; length of pectoral spine $2\frac{3}{4}$ in same distance; dorsal much nearer anal than snout; anal rays 16 to 20; size large (reaches the length of nearly a foot); colors rather dark; dorsal and caudal fins black-margined. INSIGIS, 24.
 - cc. Pectoral spine slightly retrorse-serrate without, with about six small straight teeth within, which are not one-third the diameter of the spine in length; head small, not very broad, but thin and depressed; its width $5\frac{1}{2}$ to 6 in length of body; jaws nearly equal; head $4\frac{1}{4}$ in length, depth $5\frac{3}{8}$ to $6\frac{1}{2}$; dorsal scarcely higher than long; distance from snout to dorsal about $3\frac{1}{2}$ in length; pectoral spine $3\frac{1}{2}$ to 4 in this distance; dorsal spine low, nearer snout than anal; anal rays 14 or 15; size small; color pale. EXILIS, 25.

- bb. Pectoral spines extremely strong, more than half the length of head, curved; their posterior serræ strong, spine-like, hooked backward, each about as long as the diameter of the spines:
- d. Adipose fin connected with the caudal fin; distance from snout to dorsal about $2\frac{3}{8}$ in length; pectoral spine $2\frac{1}{8}$ in this distance; dorsal fin higher than long; body not very elongate nor much depressed; the dorsal region often somewhat elevated; the depth usually $4\frac{1}{2}$ to 5 in length; head $3\frac{3}{8}$ to 4; dorsal nearer anal than tip of snout; anal 12 or 13 rays; pectoral spine curved and sharply serrate without, with six strong recurved pectinations within each as long as the diameter of the spine; body much mottled, black and grayish; top of head, tip of dorsal, middle of adipose fin, and edge of caudal definitely black; body with four broad cross-blotches, one before dorsal, one behind it, one on middle of adipose fin, and one small one behind it; size small.....MIURUS, 26.
- dd. Adipose fin entirely free from caudal fin, separated from it by a space nearly equal to the diameter of the eye; spines as in *miurus* but rather weaker; head $5\frac{1}{2}$ in length; depth $5\frac{1}{2}$; distance to dorsal $2\frac{3}{4}$ in length; pectoral spine $2\frac{3}{8}$ in distance to dorsal; width of head $4\frac{1}{8}$ in length; body moderately elongated; head broad and flat, much like that of a *Pelodichthys*; anal fin with but eleven rays; color mottled gray, faintly and irregularly spotted with darker.....ELEUTHERUS, 27.
- tt. Pectoral spine entire or grooved behind, never retrorse-serrate; adipose fin continuous, not notched:
- e. Head small and narrow, longer than broad, with small eye; its length about 4 in body, its width $5\frac{1}{2}$; upper jaw much projecting; spines very short and slender, that of the dorsal not one-third the height of the fin, and all less than one-fourth the length of head; body slender, but not elongate; distance to dorsal $2\frac{3}{8}$ in length; pectoral spine 5 in this distance, slightly retrorse-serrate without, grooved within; depth $5\frac{1}{2}$ in length; dorsal nearer anal than snout; anal 14; color mottled, rather pale...LEPTACANTHUS, 28.
- ee. Head short, broad, and deep.
- f. Head shorter, narrower, and smaller in every way, than in the next, the body more elongate, more compressed but less deep, the width $4\frac{1}{2}$ in length of body; length of head $4\frac{1}{4}$; depth of body $5\frac{1}{2}$; snout to dorsal one third of length; pectoral spine $2\frac{1}{8}$ in distance to dorsal; jaws nearly equal; anal rays 15 or 16; lower barbels pale; coloration yellowish brown, with a lateral dark streak and two dorsal ones.....GYRINUS, 29.
- ff. Head $3\frac{1}{2}$ to 4 in length, larger than in any of the other species; width of head $3\frac{3}{4}$ in length; distance from snout to dorsal $2\frac{3}{4}$ in length; body comparatively short and thick, the depth 4 to 5 in length; spines stout and rather long, that of the pectoral fin straight, about half the length of head; $2\frac{1}{8}$ in distance to dorsal fin; entirely free from serratures outside, grooved within; dorsal higher than long, nearer anal than snout; anal high, of 13 rays; adipose fin high, continuous, without any notch at all; caudal fin arising very near anal; barbels short; the lower dark; color nearly uniform yellowish brown, never blotched; a narrow black lateral streak, which is usually conspicuous.....SIALIS, 30.

25. NOTURUS FLAVUS, *Rafinesque*.

Yellow Stone Cat—Common Stone Cat.

(Figs. 54 and 55.)

- Noturus flavus*, RAF. (1818), Am. Monthly Mag. and Critical Review, p. 41; (1820), Ich. Oh. 68.—KIRTLAND (1838), Rept. Zool. Ohio, 169, 195; (1846), Bost. Journ. Nat. Hist. iv, 336.—STORER (1846), Synopsis, 406.—GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—COPE (1864), Proc. Acad. Nat. Sci. Phila. 277; (1869), Journ. Acad. Nat. Sci. Phila. 237.—GÜNTHER (1864), Cat. Fishes, v, 104.—VAILER & LUGGER (1876), Fishes Maryland, 151.—JORDAN (1877), Ann. Lyc. Nat. Hist. N. Y. —
Noturus luteus, RAF. (1819), Journ. de Physique, 421.
Noturus occidentalis, GILL (1862), Proc. Bost. Soc. Nat. Hist. 45; (1876), Capt. ? Simpson's Rept. 423.—JORDAN & COPELAND (1876), Check List, 160.
Noturus platycephalus, GÜNTHER (1864), Catalogue Fishes, v, 104.—JORDAN & COPELAND (1876), Check List, 160.

Habitat.—Vermont and Canada to Virginia, Ohio Valley and Missouri Region.

It is not quite certain which species served as the type of Rafinesque's "*flavus*". Three distinct species occur about the Falls of the Ohio, *flavus*, *sialis*, and *miurus*. Of these, "*flavus*" is the most abundant in the immediate neighborhood of the river, the others preferring clearer water than is found in most of the streams near the falls. Rafinesque speaks of his *flavus* as being entirely yellowish, and as reaching the length of a foot. *Miurus* is never yellowish; and neither *miurus* nor *sialis*, so far as I know, reach a length of more than six inches. Moreover, the *flavus* of Kirtland, Cope, and of most writers, is the species now under consideration.

N. occidentalis Gill I also consider the same. There is nothing in the description to indicate difference, and, on examination of specimens supposed to be the original types of *occidentalis*, I am unable to find any distinctive characters whatever. Like *Ichthaelurus punctatus* and *Amiurus lividus*, the *Noturus flavus* is a species of wide geographical range, and its occurrence in Nebraska is not surprising.

N. platycephalus Günther is evidently the same as *flavus*. *N. occidentalis* Günther is based on specimens of *Noturus marginatus*, sent by the Smithsonian Institution to the British Museum, Prof. Gill informs me.

I have examined specimens, which I refer to *flavus*, from Saint Lawrence River, New York, from Lake Champlain, from the Potomac River, from the Ohio River in West Virginia, in Ohio, and in Indiana, from the Miami, White, and Wabash Rivers, from the Missouri River, from Lake Michigan, and from Platte River.

24. NOTURUS INSIGNIS, (*Richardson*) Gill & Jordan.**Margined Stone Cat.**

(Figs. 56 and 57.)

Pimelodon livrée, LE SUEUR (1819), Mém. du Mus. v, 155.*Pimelodus insigne*, RICHARDSON (1836), Fauna Boreali-Americana, iii, 132 (name only, based on Le Sueur's description).*Pimelodus lemniscatus*, CUV. & VAL. (1840), xv, 144.—STORER (1846), Synopsis, 405.*Noturus lemniscatus*, GIRARD (1859), Proc. Acad. Nat. Sci. 158.—GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—GÜNTHER (1864), Cat. Fishes, v, 104.—JORDAN (1876), Man. Vert. 303.—JORDAN & COPELAND (1876), Check List, 160.*Noturus occidentalis*, GÜNTHER (1864), Cat. Fishes, v, 105 (not of Gill).*Noturus marginatus*, BAIRD, MSS.—COPE (1839), Journ. Acad. Nat. Sci. Phila. 237.—COPE (1870), Proc. Am. Philos. Soc. 484.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1876), Ann. Lye. Nat. Hist. N. Y. —.

Habitat.—Pennsylvania to South Carolina. This species was first noted by Le Sueur under the name of *Pimelodon livrée*, but for some reason that author neglected to give it a classical name. The name of *insigne* was supplied by Richardson, and that of *lemniscatus* by Cuvier and Valenciennes. The description of the coloration is such as to leave no possible doubt of the identity of this species with Le Sueur's.

No satisfactory description of this common fish has yet been published. It is well distinguished from *miurus* and *exilis* by the characters given above in the analysis of species.

25. NOTURUS EXILIS, Nelson.

Slender Stone Cat.

(Figs. 58 and 59.)

Noturus exilis, NELSON (1876), Bull. Ills. Mus. Nat. Hist. 51.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1877), Ann. Lye. Nat. Hist. N. Y. —.*Habitat*.—Wisconsin and Illinois to Missouri and Kansas.

The synonymy of this species needs no remark. Its relations are entirely with *marginatus*, from which species it is undoubtedly distinct. Specimens from Wisconsin are much less elongate than Nelson's original types. I do not, however, consider them specifically distinct.

26. NOTURUS MIURUS, Jordan.

Variegated Stone Cat.

(Figs. 60 and 61.)

Noturus miurus, JORDAN, MSS.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1877), Ann. Lye. Nat. Hist. 46 (name only).—JORDAN (1877), Ann. Lye. Nat. Hist. N. Y. —.*Noturus marginatus*, JORDAN (1876), Man. Vert. 303.—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50 (not of Baird).*Habitat*.—Great Lakes and Ohio Valley to Wisconsin and Louisiana.

This species, although a very abundant one in the Mississippi Valley, seems to have been entirely overlooked by our writers on Ichthyology; the great development and serration of the pectoral spines will always serve to distinguish it from all of the preceding. I have seen specimens from Louisiana as well as from various localities in the Ohio Valley and from Lake Michigan.

27. NOTURUS ELEUTHERUS, *Jordan*.*

Free-finned Stone Cat.

(Figs. 62 and 63.)

Noturus eleutherus, JORDAN (1877), Ann. Lyc. Nat. Hist. —

Habitat.—French Broad River, Tennessee; Tar River, North Carolina.

This fish is not a variety of *miurus*; it is either a distinct species or a very remarkable monstrosity. I think now that the former is the case, and I have designated it by the above name, in allusion to the adipose fin being free from the caudal. The type-specimen from the French Broad River very strongly resembles a young *Pelodichthys*, but has the upper jaw longer. The adipose fin is, as usual, decurrent, but it is entirely separate from the beginning of the caudal.

**Noturus eleutherus*, JORDAN.—Since the first part of this paper was printed, I have been able to examine a large number of fine specimens collected by Mr. J. W. Milner, of the United States Fish Commission, in the Tar River near Tarboro', N. C. These specimens show the following characters:—

Body stout, broad forward, tapering behind. Head large, flattish, $4\frac{1}{2}$ in length of body, without caudal; depth of body $5\frac{1}{2}$ in length; width of head $4\frac{1}{2}$ in length of body. Mouth large, the upper jaw much projecting; barbels rather long. Adipose fin rather high, so deeply notched that the continuity of the fin is broken for a distance nearly equal to the diameter of the eye. A strong keel on the back in front of the adipose fin. Caudal fin rounded. Distance from snout to dorsal 3 in length of body. Pectoral spine in this distance 2 times; in head $1\frac{1}{2}$. Dorsal spine $\frac{2}{3}$ the height of the fin, $3\frac{1}{2}$ times in distance from snout to dorsal, $2\frac{1}{2}$ in length of head. Pectinations of pectoral spine very strong, recurved, nearly as long as the diameter of the spine. Front of pectoral spine with small teeth turned forward. Fin-radii: D. 1, 7; A. 12; P. 1, 8; V. 9. Color much as in *N. miurus*, extensively variegated. Snout, cheeks, and occipital region black. A black bar across front of dorsal, one behind dorsal, and another across middle of adipose fin; base of caudal fin black. One or two narrow horizontal black bars across dorsal and anal near their tips. Caudal vaguely barred, largely black, its tip white. Length of specimens $4\frac{3}{4}$ inches.

This is one of the most striking of our *Siluride*. Its relations are with *N. miurus* but the nearly free adipose fin will always serve to distinguish it. I have seen no specimens of *miurus* so large and stout as these of *eleutherus*.

28. NOTURUS LEPTACANTHUS, *Jordan*.**Weak-spined Stone Cat.**

(Figs 64 and 65.)

Noturus leptacanthus, JORDAN (1876), MSS.—JORDAN & COPELAND, Check List, 160 (name only).—JORDAN (1877), Ann. Lye. Nat. Hist. —.

Habitat.—Etowah River, Georgia.

But a single specimen of this species is known; it is, however, totally distinct from all the rest; its relations are chiefly with *gyrinus*.

29. NOTURUS GYRINUS, (*Mitchill*) *Rafinesque*.**Tadpole Stone Cat.**

(Fig. 66 and 67.)

Silurus gyrius, MITCHILL (1818), Am. Monthly Mag. March, 322.—DE KAY (1842), Fishes N. Y. 186.

Noturus gyrius, RAF. (1819), Journ. de Physique, 421; (1820), Ich. Oh. 62.—GILL (1862), Proc. Bost. Soc. Nat. Hist. 45.—COPE (1869), Journ. Acad. Nat. Sci. Phila. 237.—JORDAN (1876), Mar. Vert. 303.—JORDAN & COPELAND (1876), Check List, 160.—JORDAN (1877), Ann. Lye. Nat. Hist. —.

Schilbeodes gyrius, BLEEKER (1858), l. c.

Habitat.—Southern New York to Pennsylvania.

I have examined specimens of this species from Orange, Rockland, and Chemung Counties, New York. It resembles the next, but is in every way slenderer and weaker.

30. NOTURUS SIALIS, *Jordan*, sp. nov.**Chubby Stone Cat.**

(Figs. 68 and 69.)

Noturus flarus, JORDAN (1876), Mar. Vert. 303 (in part).—NELSON (1876), Bull. Ills. Mus. Nat. Hist. 50.—JORDAN (1877), Proc. Acad. Nat. Sci. Phila. 46.

Habitat.—Entire Mississippi Valley, Great Lake Region, and in Red River of the North.

Comparison of eastern and western specimens referred to *gyrinus* show surprising differences of form, and as these differences appear to be constant in a great number of specimens examined from widely separated localities, I have decided to separate the western form as a distinct species.

The eastern form, or *gyrinus*, has the head shorter and every way smaller, and the body proper more elongate, more compressed, almost ribbon-shaped, and the spines rather weaker. The coloration is the

same in both, yellowish-brown, with a lateral dark streak and two more dorsal ones. The lower barbels are usually dark in *sialis*, pale in *gyrinus*. The outline drawings of the two which accompany this paper shows the differences better than they can be expressed in words.

Noturus gyrinus is apparently a starved representative of *Noturus sialis* as *N. exilis* is of *N. insignis*, but in the latter case the "starved" form is the western one.

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The following list comprises all the works known to the writer in which new species or genera of American fresh-water *Siluridae* are indicated, or in which original descriptions are given of genera or species previously known. In general, I have endeavored to include all papers in which anything of importance was added to or subtracted from the sum of our knowledge of these fishes:—

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[Contains a description and an outrageous figure of a Catfish from South Carolina. The figure is not identifiable, but has served as the basis of the earlier accounts of *Silurus catus*.]

LINNÉ (Carl von). Caroli Linnæi Equitis De Stella Polari, Archiatri Regii, Med. et Botan. Profess. Upsal; Acad. Upsal. Holmens. Petropol. Berol. Imper. Lond. Monspel. Tolos. Florent. Soc. Systema Naturæ per Regna Tria Naturæ, secundum Classes, Ordines, Genera, Species, cum Characteribus, Differentiis, Synonymis, Locis.—Editio Decima, Reformata. Cum Privilegio Sæc Ræ Mætis Sueciæ.—Holmiæ, Impensis Direct. Laurentii Salvii 1758. Tomus I, Regnum Animale.

[Describes sp. n. *Silurus catus*.]

BLOCH (Mark Elieser) and SCHNEIDER (Johann Gottlob). M. E. Blochii Doctoris Medicinæ Berolinensis, et societatibus literariis multis adscripti, Systema Ichthyologiæ iconibus CX illustratum.—Post obitum auctoris opus inchoatum absolvit, correxit, interpolavit Jo. Gottlob Schneider, Saxo.—Berolini, sumptibus Auctoris impressum et bibliopolio Sanderiano commissum, 1801.

[Describes *Silurus catus* Linnæus, adding to Linnæus's account the characters "caudali pinna bifurca: dorsali et pectorali inermi, omnibus obscure rubentibus" from Catesby's figure.]

MITCHILL (Samuel Latham). Memoir on Ichthyology. The Fishes of New York described and arranged. In a supplement to the Memoir on the same subject, printed in the New York Literary and Philosophical Transactions, vol. i, pp. 355, 492. By Samuel L. Mitchill. < The American Monthly Magazine and Critical Review, vol. ii, (New York), pp. 241-248, 321-328, 1818.

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PAFINESQUE (Constantine Samuel). Discoveries in Natural History, made during a Journey through the Western Region of the United States by Constantine Samuel Rafinesque, esq. Addressed to Samuel L. Mitchill, President, and other members of the Lyceum of Natural History in a letter dated at Louisville, Falls of the Ohio, 20th July, 1818. < American Monthly Magazine and Critical Review, New York, September, 1818.

[Describes *Silurus punctatus andolivargæ* sp. nov.]

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[Describes *Noturus flavus* gen. et sp. nov.]

— Prodrôme de 70 nouveaux Genres d'Animaux découverts dans l'intérieur des États-Unis d'Amérique durant l'année 1818. < Journal de Physique, de Chimie et d'Histoire Naturelle, Paris, June, 1819.

[Describes *Noturus luteus* and *Pilodictis limosus* gen. et sp. nov.]

LE SUEUR (Charles A.). Notice de quelques Poissons découverts dans les lacs du Haut-Canada, durant l'été de 1816, par Ch. A. Le Sueur. < Mémoires du Muséum d'Histoire Naturelle, Paris, 1819, tome cinquième.

[Describes sp. nov. *Pimelodus albidus*, *P. nebulosus*, *P. aeneus*, *P. caudafurcatus*, *P. nigricans*, *P. natalis*, and (without Latin name) *Pimelodon livrée* (= *P. insigne* Rich., *P. lemniscatus* C. & V.).]

RAFINESQUE (Constantine Samuel). Description of the Silures or Cat-Fishes of the River Ohio, by C. S. Rafinesque, Professor of Botany in the Transylvania University of Lexington, Kentucky. < Quarterly Journal of Science, Literature and Arts, Royal Institution, London, 1820, ix.

[Describes the following new species and varieties:—*Silurus maculatus* (= *S. punctatus*, 1818); var. *erythroptera*; *S. pallidus*; var. *marginatus*; var. *lateralis*; var. *leucoptera*; *S. cerulescens*; var. *melanurus*; *S. argentinus*; *S. nebulosus* (= *S. olivaris*, 1818); *S. viscosus*; *S. lividus*; var. *fuscatus*; *S. melas*; *S. cupreus*; *S. xanthocephalus*; and *S. limosus*.]

— Ichthyologia Ohienensis or Natural History of the Fishes Inhabiting the River Ohio and its Tributary Streams. Preceded by a physical description of the Ohio and its branches by C. S. Rafinesque, Professor of Botany and Natural History in Transylvania University, Author of the Analysis of Nature, &c., &c., member of the Literary and Philosophical Society of New York, the Historical Society of New York, the Lyceum of Natural History of New York, the Academy of Sciences of Philadelphia, the American Antiquarian Society, the Royal Institute of Natural Sciences of Naples, the Italian Society of Arts and Sciences, the Medical Societies of Lexington and Cincinnati, &c., &c.—The art of seeing well, or of noticing and distinguishing with accuracy the objects which we perceive is a high faculty of the mind, unfolded in few individuals, and despised by those who can neither acquire it, nor appreciate its results.—Lexington, Kentucky, printed for the Author by W. G. Hunt (price one dollar).—1820. (1 vol., 8vo, 90 pp.)

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— Extracts from A Second Series of Zoological Letters written to Baron Cuvier of Paris, by Prof. Rafinesque in 1831. < Atlantic Journal and Friend of Knowledge, Philadelphia, 1832, pp. 19-22.

[Describes numerous shells, worms, "*Perostomes*",* etc. I copy the part relating to fishes for the edification of ichthyologists:—

"I send you, as you request, the figure, description, and a specime of my *Trinectes Scabra*, a new G. of fish near to *Achirus* found in the River Schuylkill; it has only three fins: dorsal, anal and caudal. "Also the description and figure of a large and beautiful new catfish from the River

* * * This name is very good, but if not agreeable to all, I have half a dozen others to offer as substitutes: *Biopores*, or *Zoopores*, or *Leptemes*, or *Adelostomes*, &c. Because it is my wish that this class or large section of animals should bear a good name given by me, instead of the delusory one of *Animalcula* or *microscopic animals*, which does not apply to all. . . . The *Miasmata* or miasmatic animalcula of the air, may be the invisible birds of this class, or aerial insects floating in the air."—(RAF. op. cit., p. 21.)

Tennessee discovered in 1823, *Pimelodus lutescens*; it was three feet long, excellent to eat, of a ochraceous yellow colour, belly white, jaws equal, eyes round, tail forked, first dorsal falciform, second dorsal nearly as large as the anal."—(RAF., *l. c.*, p. 20.)

"I send you also the figures and descriptions of five new fishes No. 3 to 7. *Zoripus punctatus*, *Semotilus notatus*, *Lepemius fasciatus* and *biineatus*, *Luxilus auratilis* and *Zonargyrea virescens*. All observed in the waters of Kentucky since publishing my Ichthyology of the Ohio in 1820, except the *Lepemius*."—(RAF., *l. c.*, p. 22.)

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[Description of *Pimelodus affinis* sp. nov. This species is here stated to be a very near affine of *Pimelodus ærulescens*. From old labels in the museum, it appears that the species called by me *Ichthæurus furcatus* was identified by Dr. Girard with *Pimelodus ærulescens*, while the *Pimelodus furcatus* of Girard is what I call *Ichthæurus punctatus*.]

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70. *Silurus glanis*, Linn. Lake Neufchâtel, Switzerland. (From No. 5935.)
 71. *Stizostethium canadense*, (Smith) Jordan. (Pyloric cæca.) p. 49.
 72. *Stizostethium salmoneum*, Rafinesque. (Pyloric cæca.) p. 47.

PLATE XLV.

73. *Elassoma zonata*, Jordan. Little Red River, Ark. (From type.) p. 50.
 74. *Asternotremia mesotrema*, Jordan. Little Red River, Ark. (From type.) p. 52.

PLATE 1.

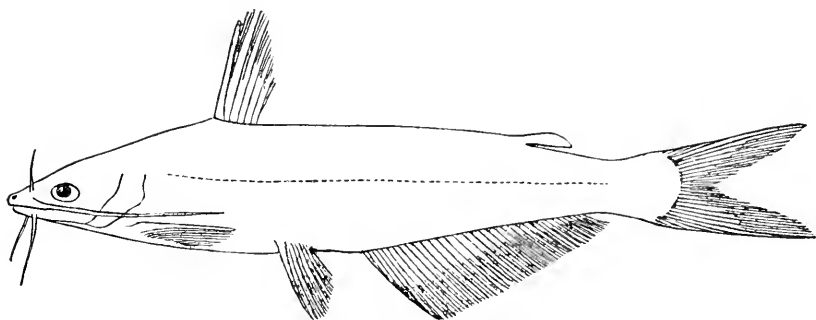


FIG. 1—*Ichthaelurus furcatus* (C. & V.) Gill.
Texas. From types of *affinis*

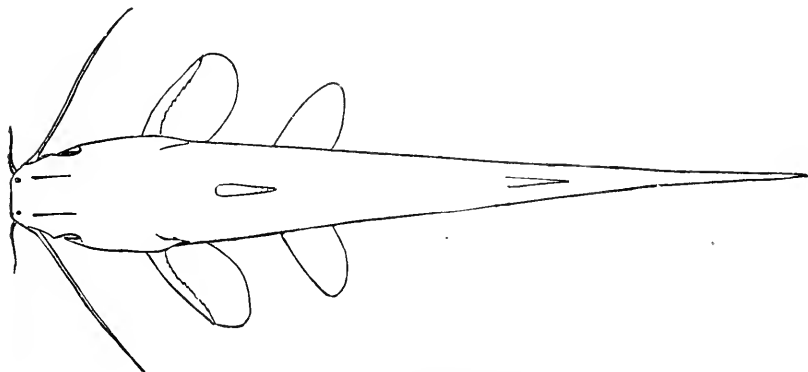


FIG. 2—*Ichthaelurus furcatus* (C. & V.) Gill.
Texas. From types of *affinis*.

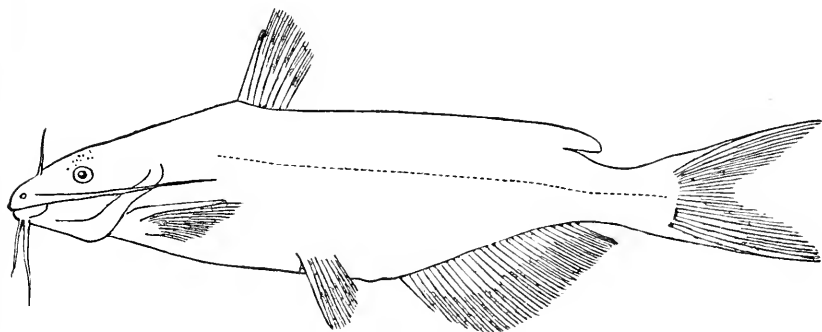


FIG. 3—*Ichthaelurus robustus* (Jordan.)
(From type.)

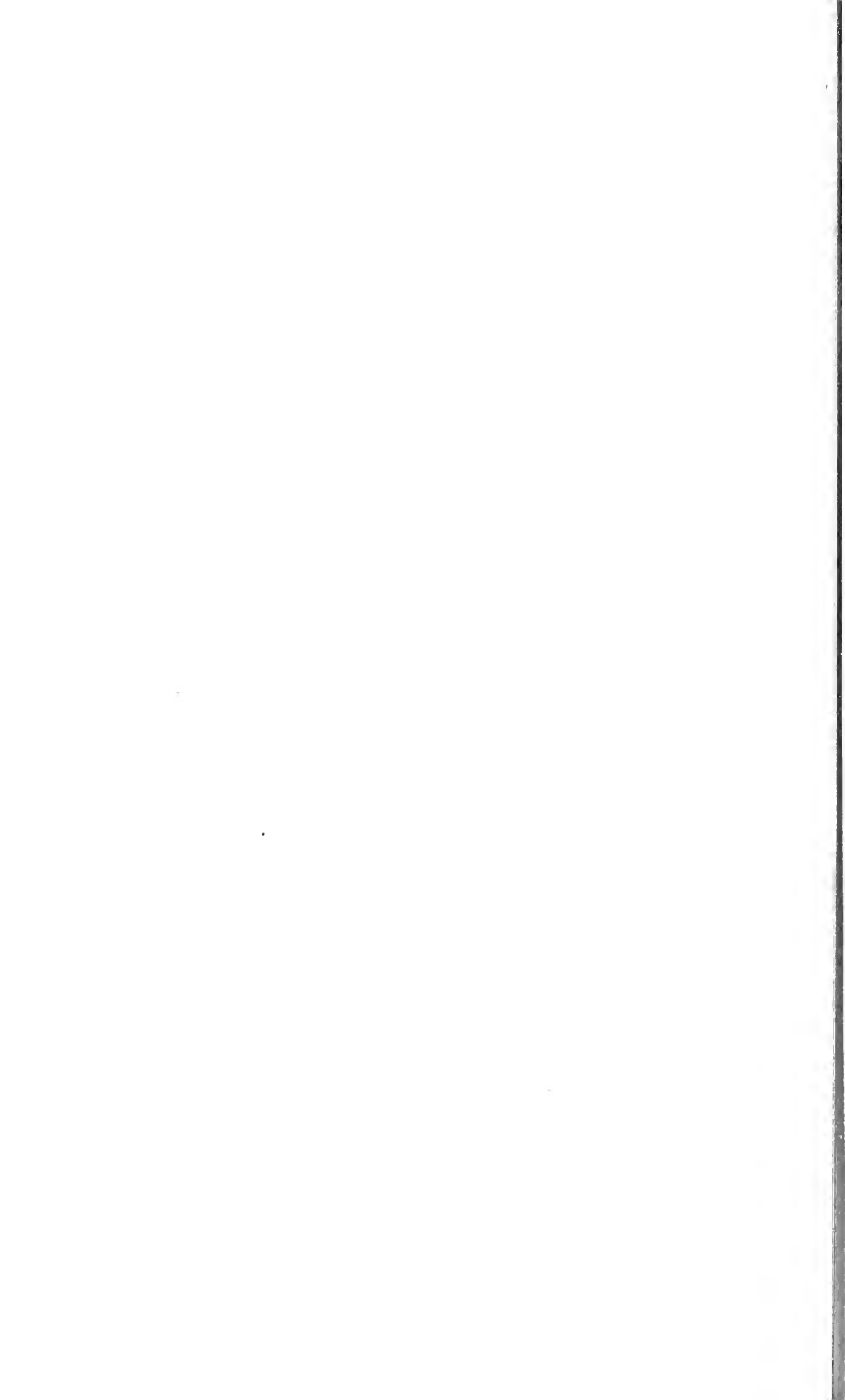


PLATE 2.

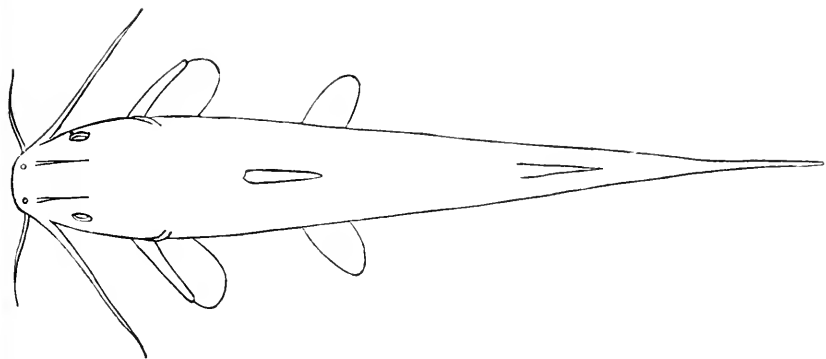


FIG. 4.—*Ichthaelurus robustus* (Jordan.)
(From type.)

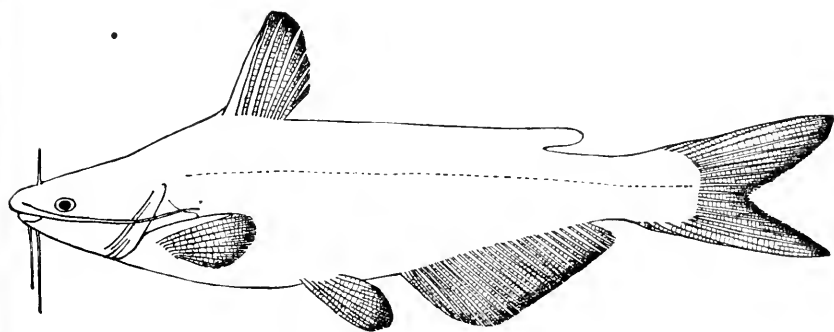


FIG. 4 (b)—*Ichthaelurus robustus* (Jordan.)
Illinois River. Reduced one-half.

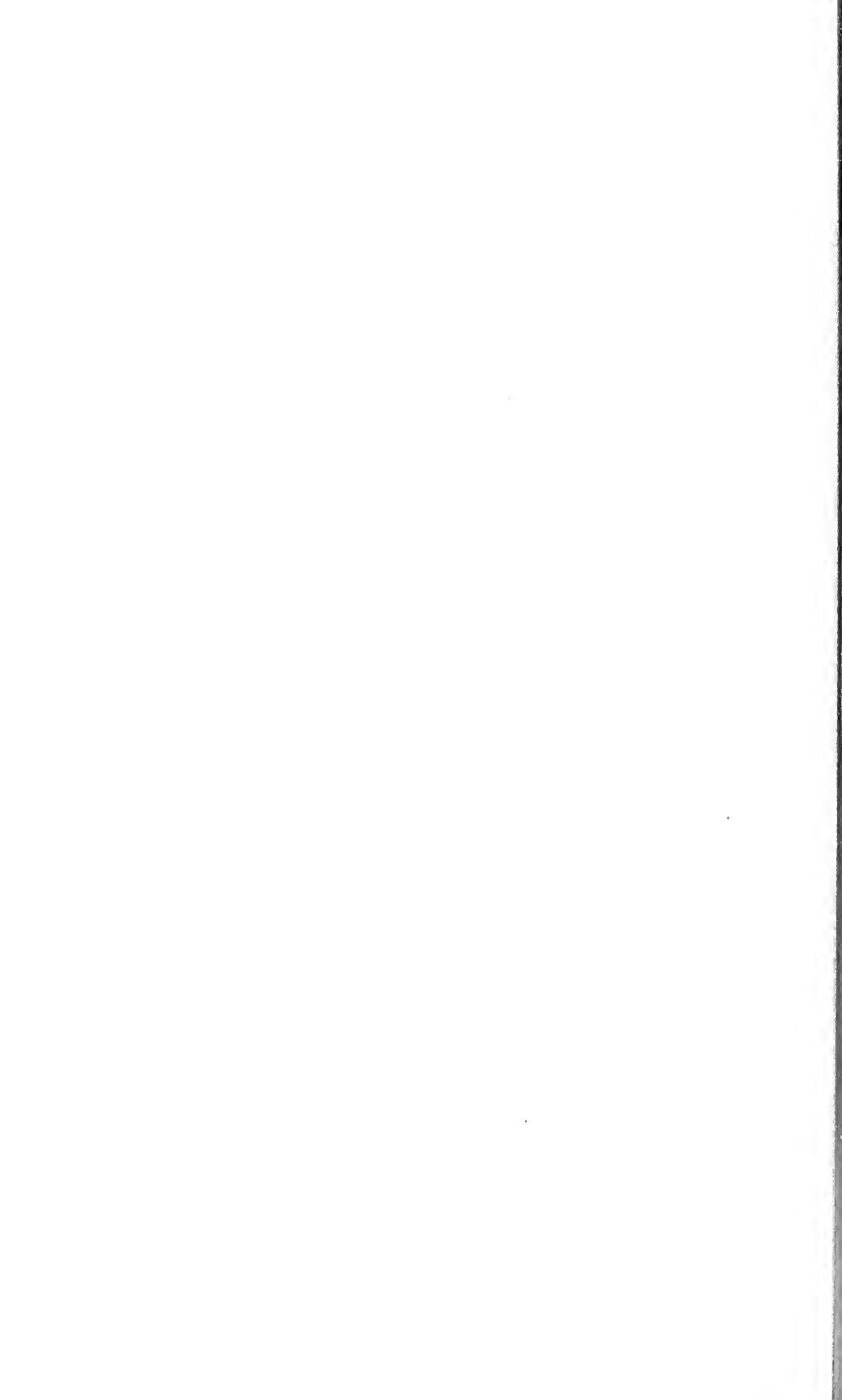


PLATE 3.

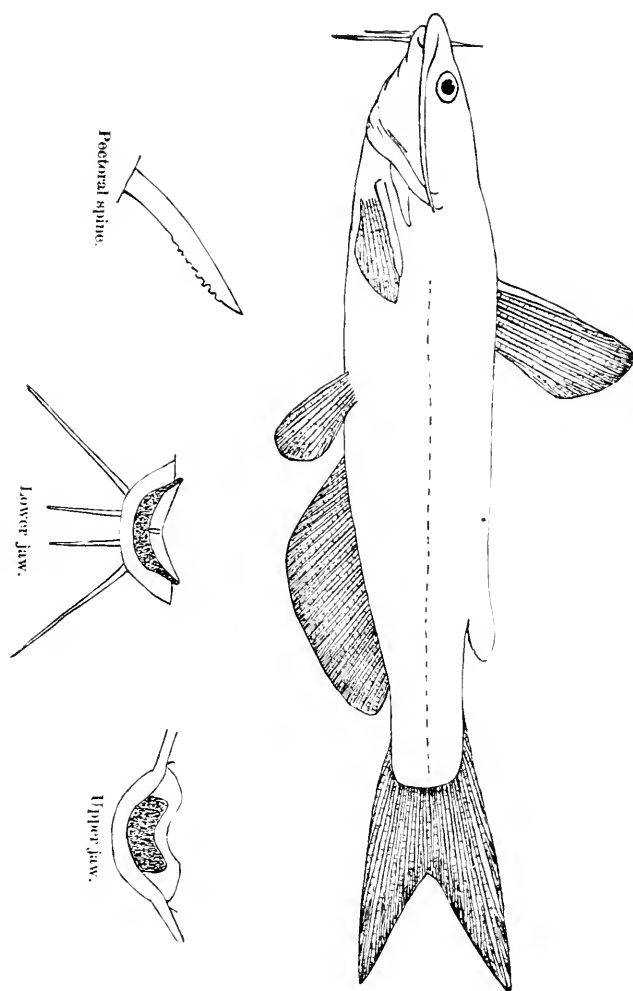


FIG. 5.—*Ichthyurmus punctatus* (Dog) for
Chittabooshee R., Ga. Reduced one-half.

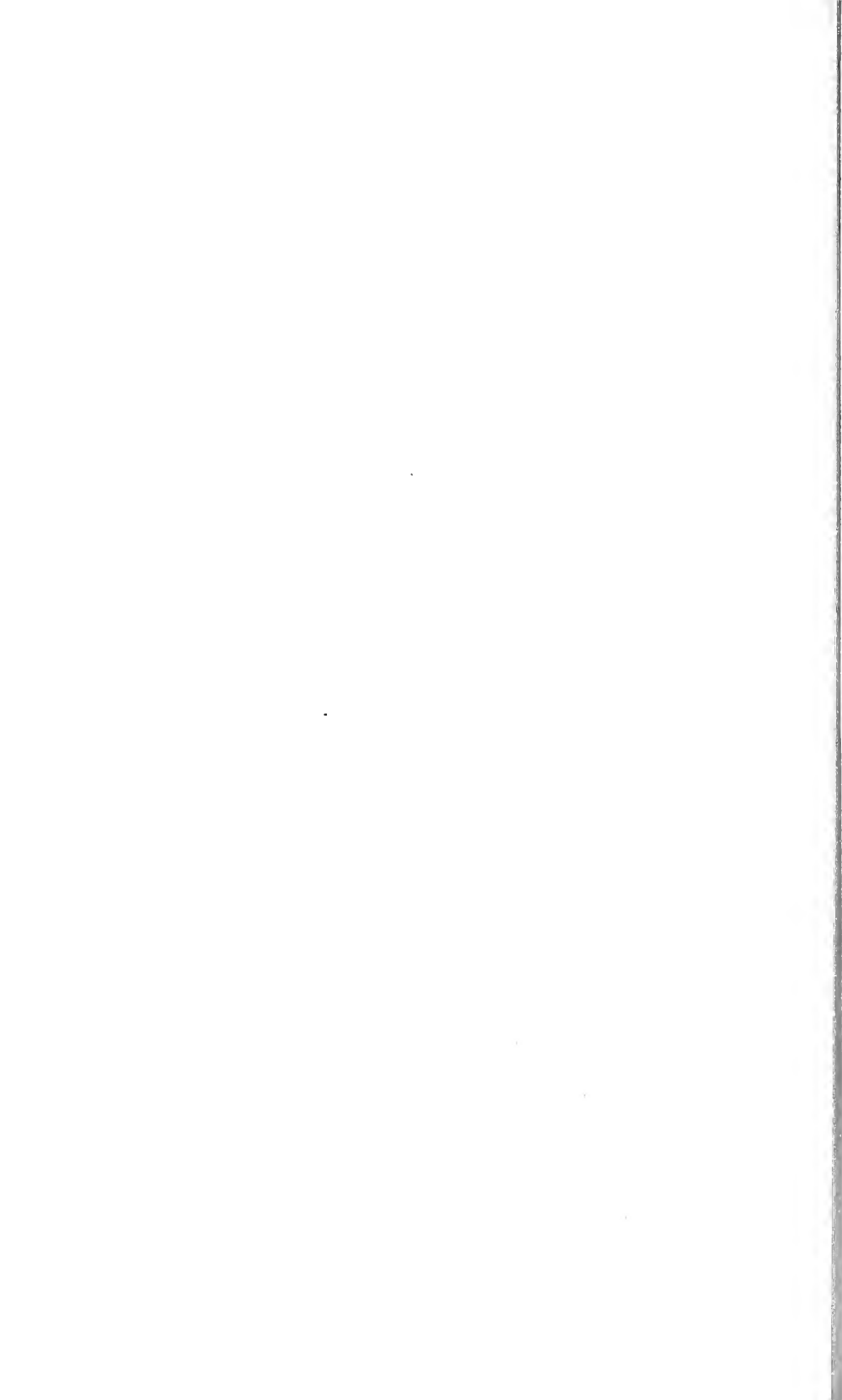


PLATE 4.

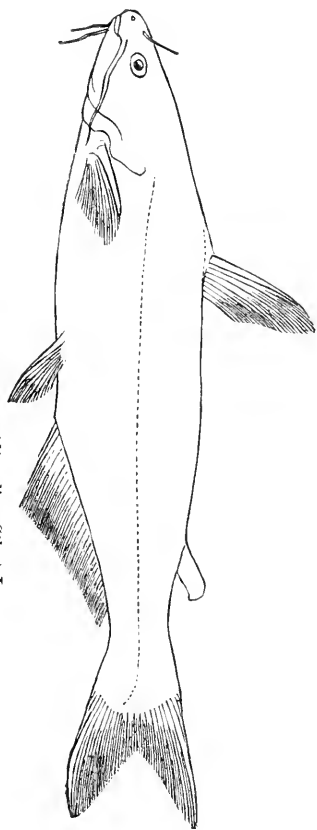


FIG. 7.—*Ichthyophrys meridionalis*, (Gibb.) dor.
(Central America.
(From Günther's figure.)

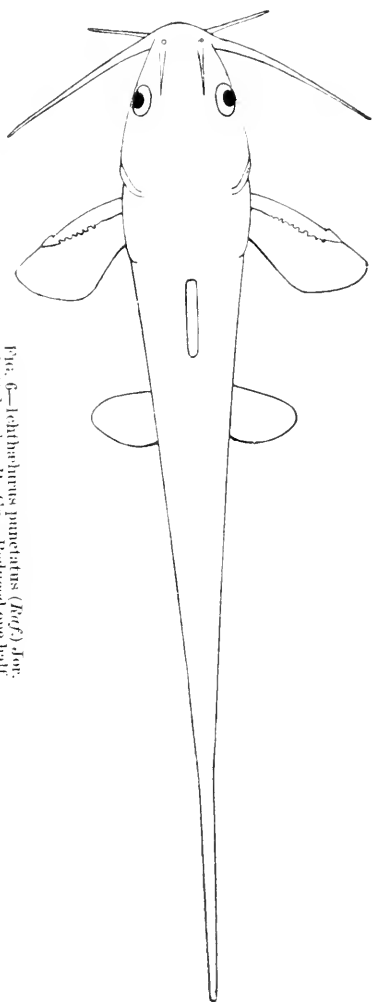


FIG. 6.—*Ichthyophrys punctatus* (Raf.) dor.
(Chattahoochee R., Ga. Reduced one-half.



FIG. 8.—*Ichthyophrys meridionalis* (Gibb.) dor.
(Central America.
(From Günther's figure.)

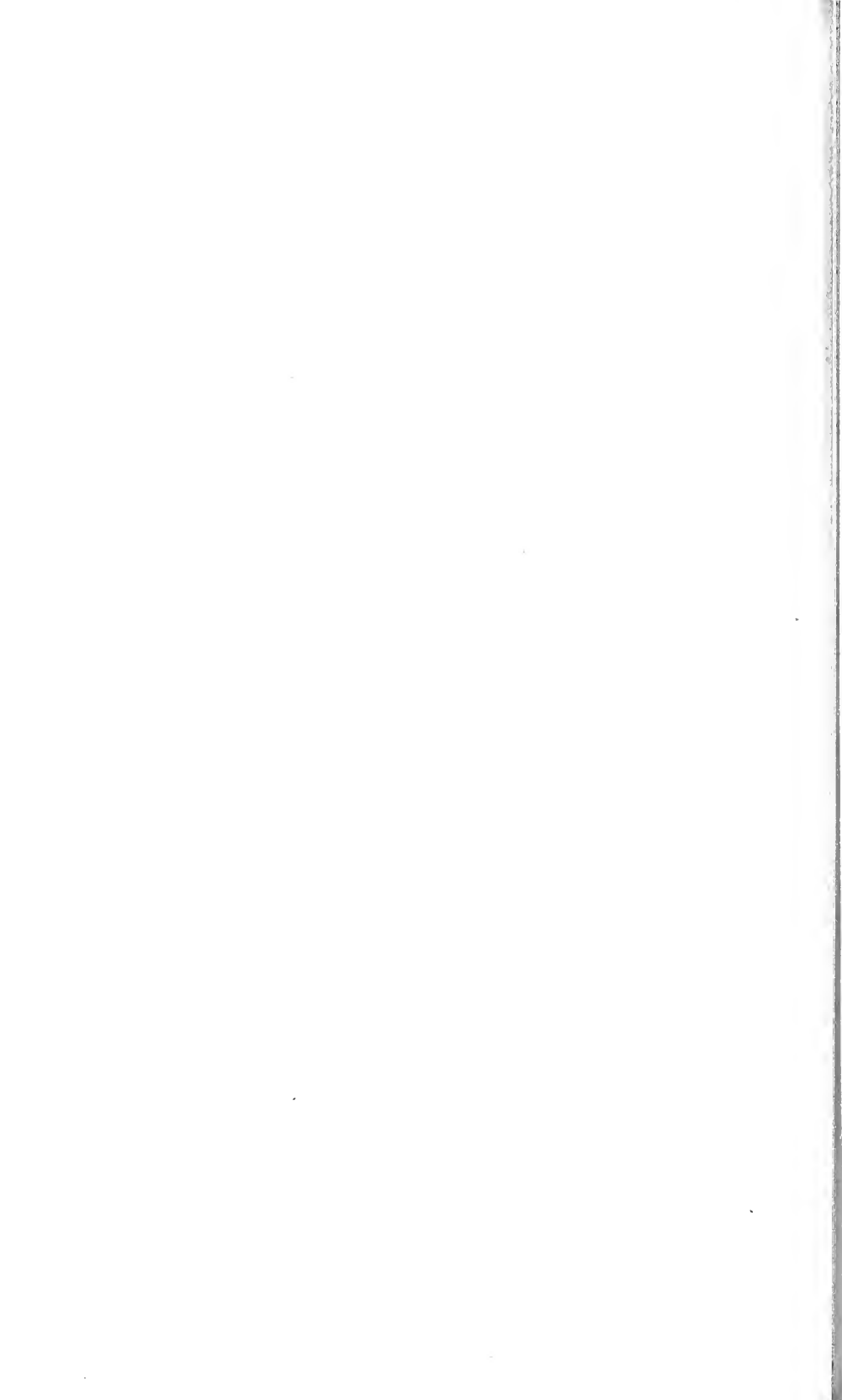


PLATE 5.

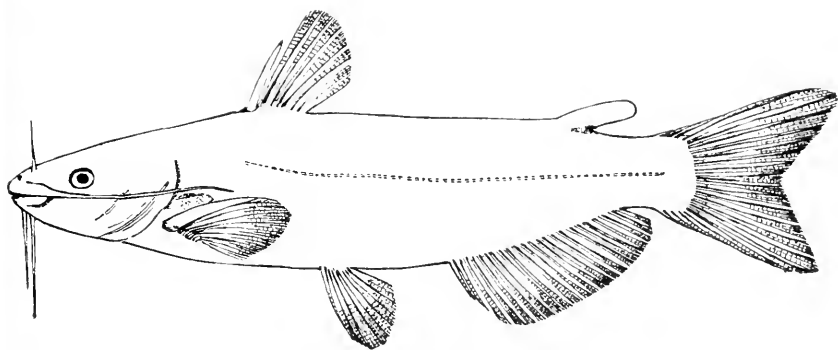


FIG. 9—*Amiurus lupus* (Grd.) Gthr.
Texas. (From type.)

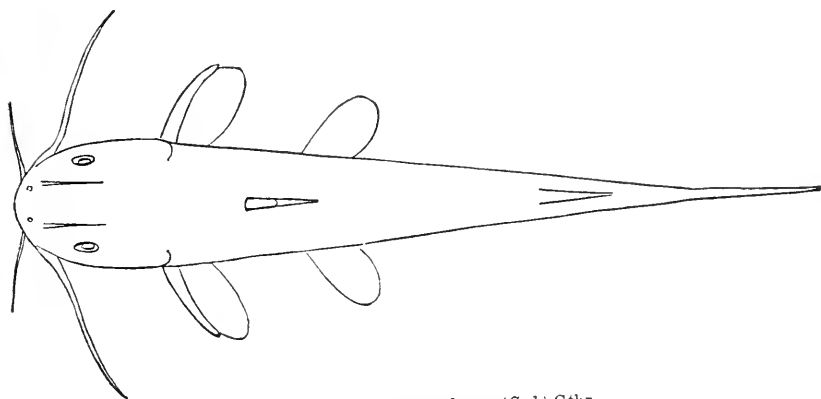


FIG. 10—*Amiurus lupus* (Grd.) Gthr.
Texas. (From type.)

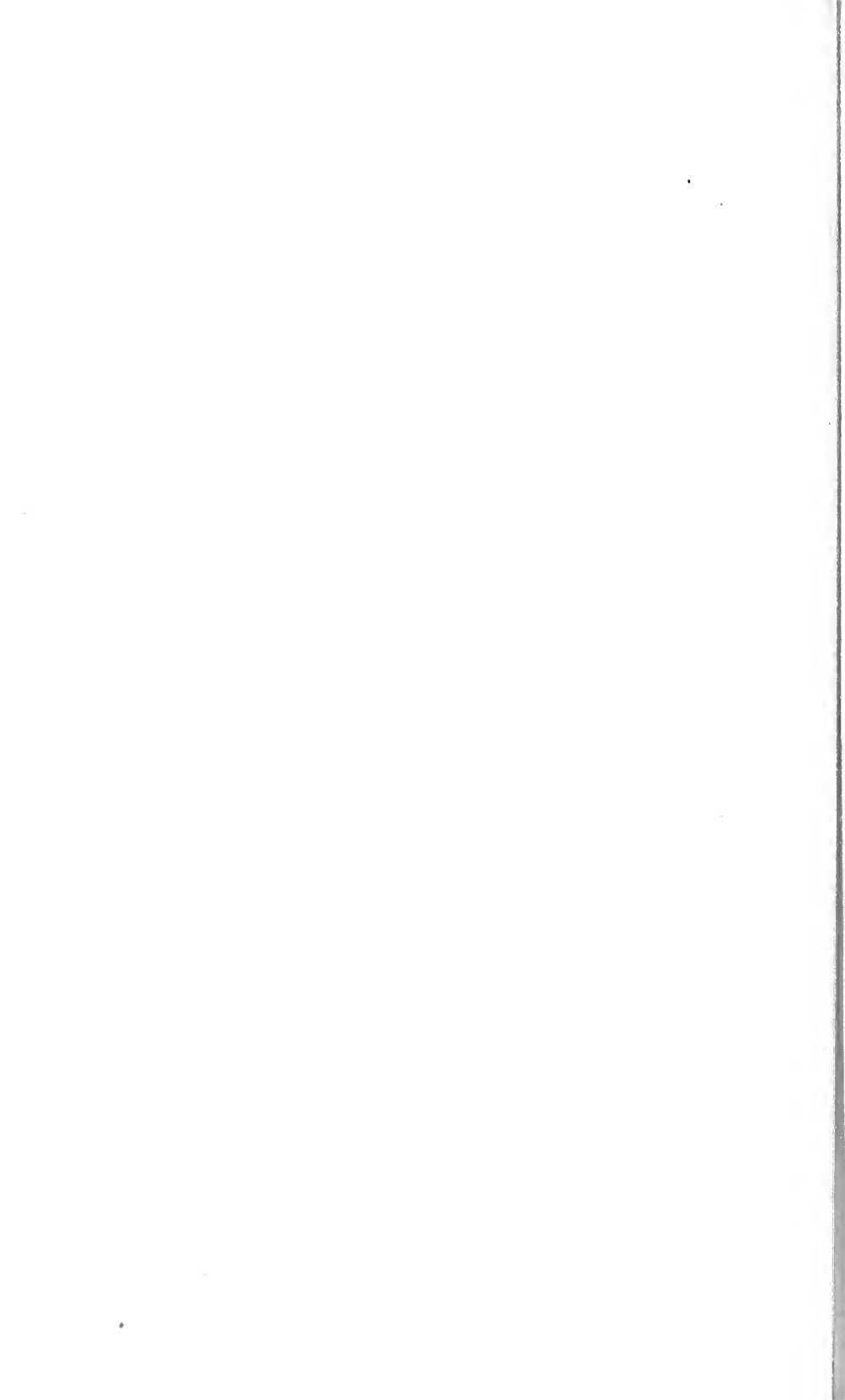


PLATE 6.

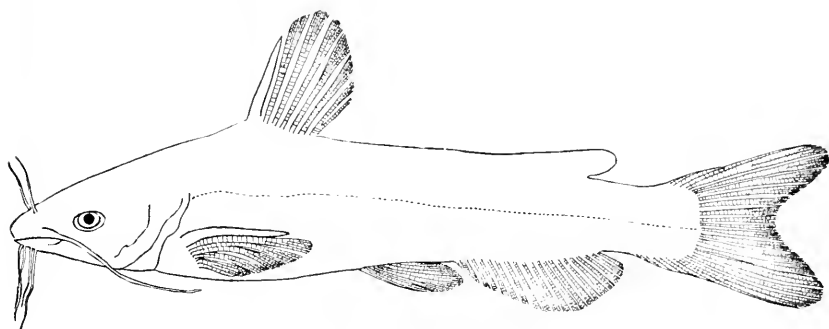


FIG. 11—*Amiurus niveiventris* (Cope.)
Neuse River. (From type.) Reduced.



FIG. 12—*Amiurus niveiventris* (Cope.)
Neuse River. (From type.) Reduced.

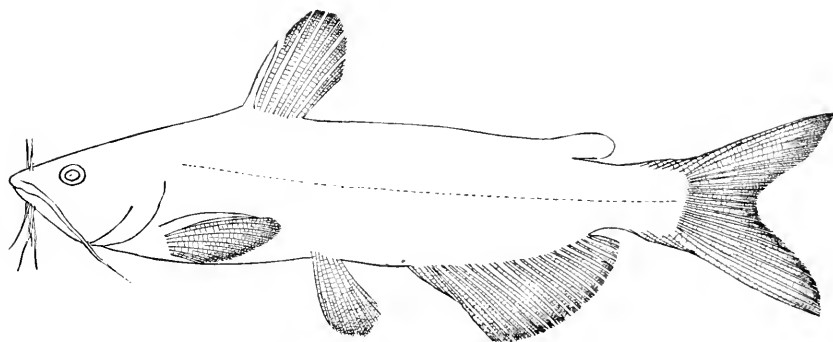


FIG. 13—*Amiurus nigricans* (Le S.) Gill.
Lake Erie.

PLATE 7.

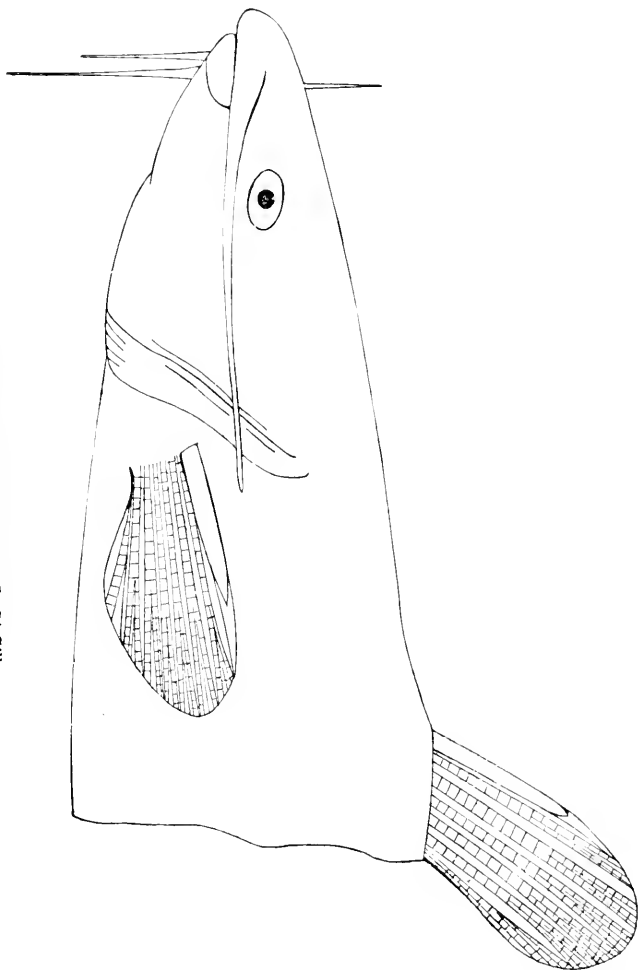


FIG. 14 (b)—*Amirus nigricans* (Le S.) Gill.
Ohio R., Leavenworth, Ind. Reduced one-half.

PLATE 8.

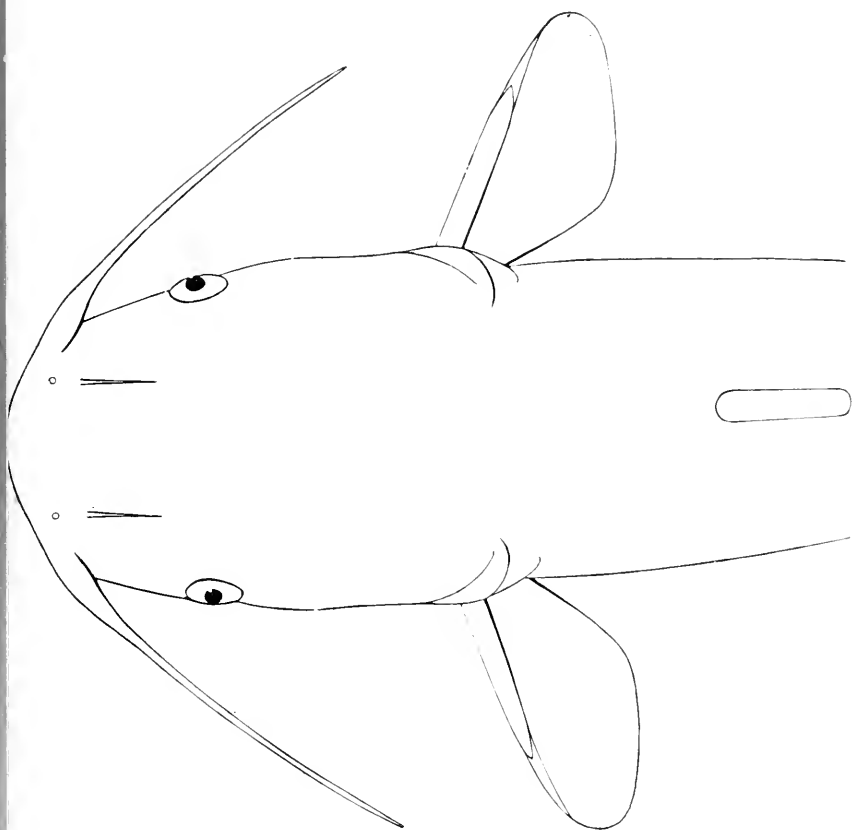


FIG. 14 (c)—*Amiurus nigricans* (Le S.) Gill.
Ohio R., Leavenworth, Ind. Reduced one-half.



PLATE 9.

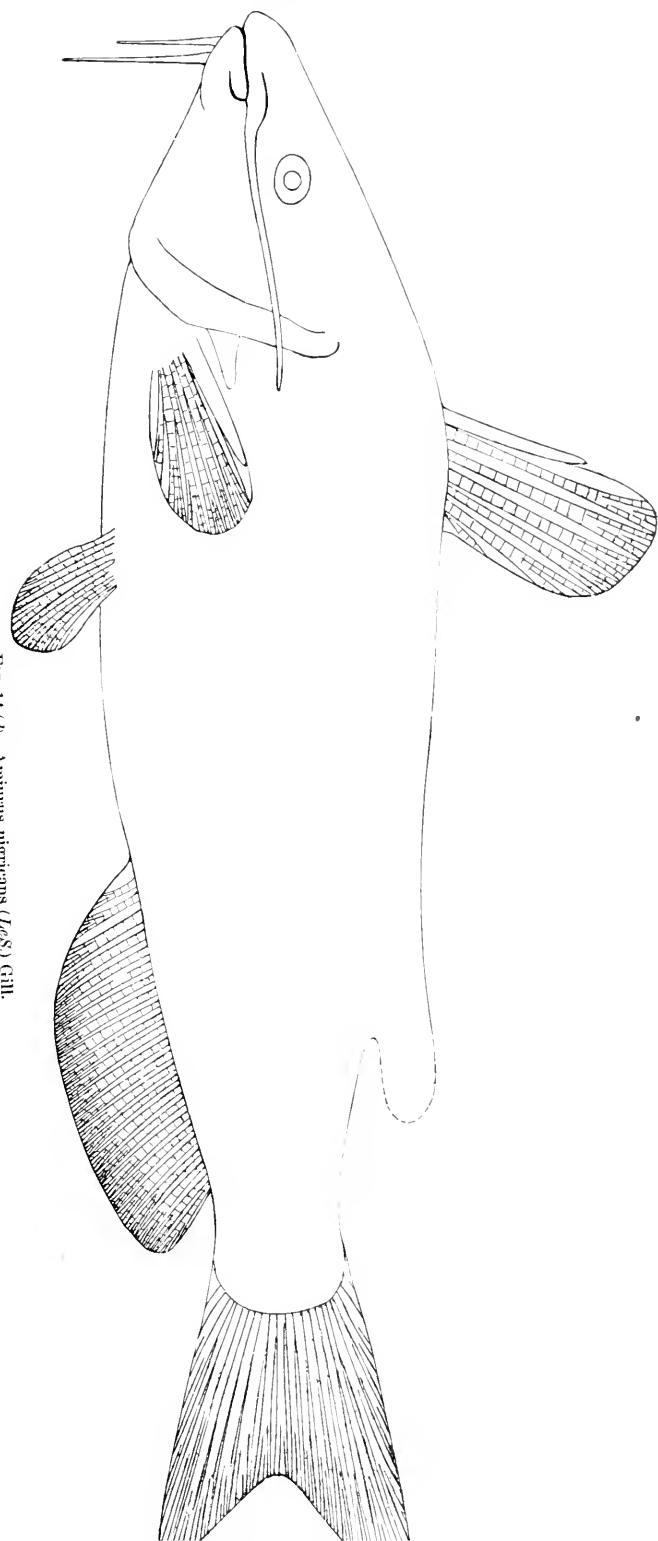


FIG. 14 (d).—*Amiurus nigricans* (Ls.) Gill.
Florida. (From a mounted skeleton.)

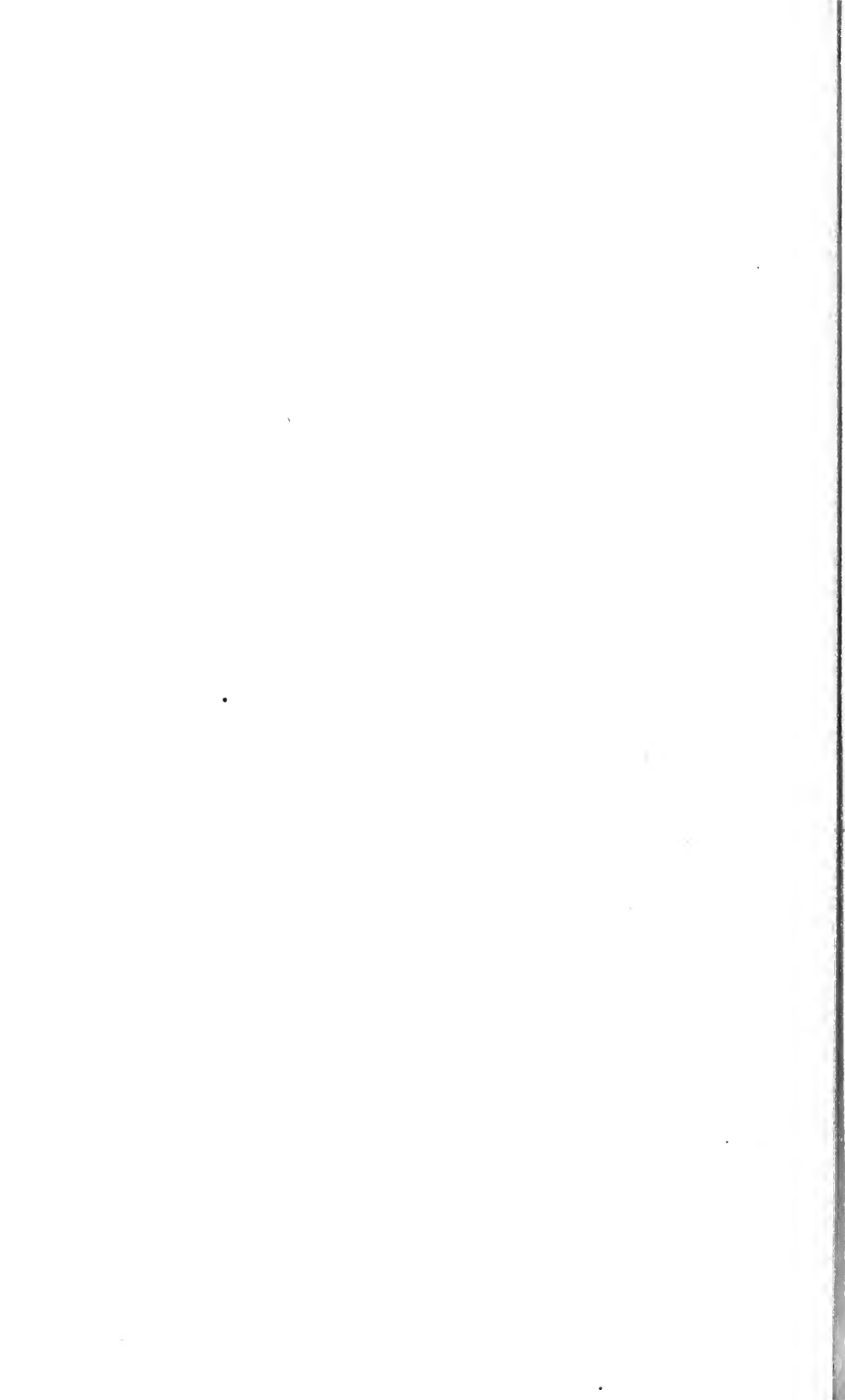


PLATE 10.

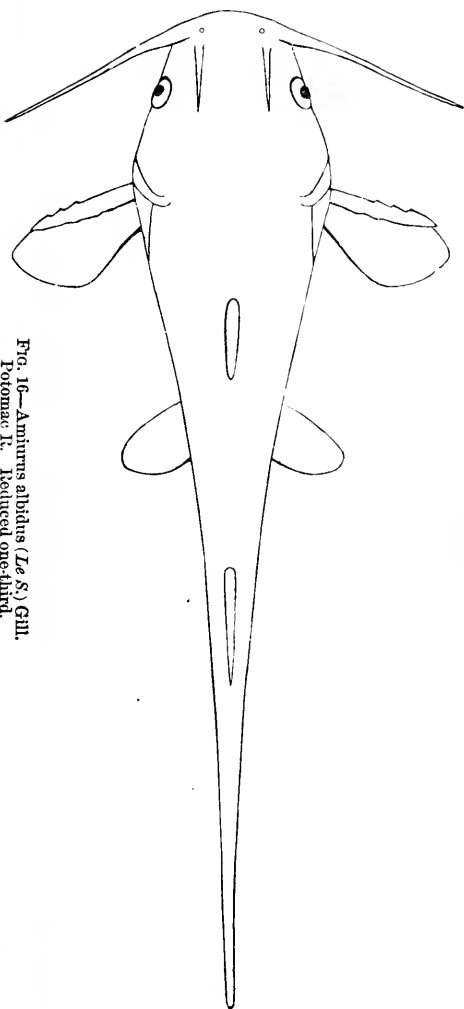


FIG. 16.—*Amiurus albidus* (Le S.) Gill.
Potomac R. Reduced one-third.

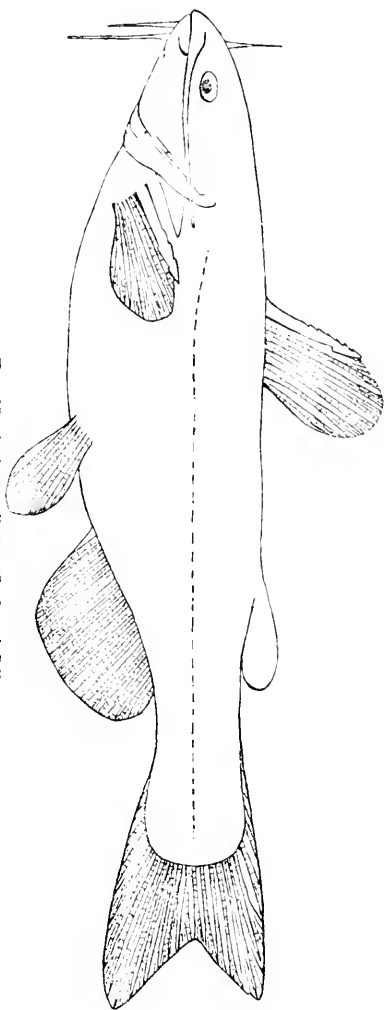


FIG. 15.—*Amiurus albidus* (Le Saez) Gill.
Potomac R. Reduced one-third.

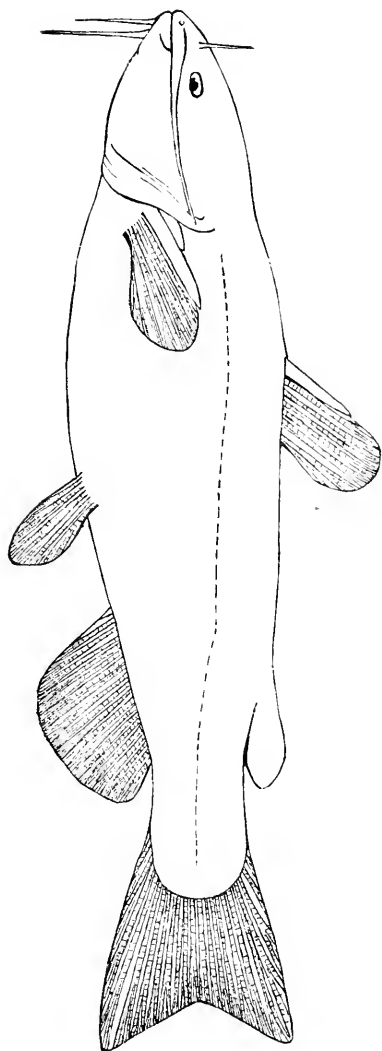


FIG. 17.—*Amurus lophius* (Cope.)
Potomac River. Reduced one-half.

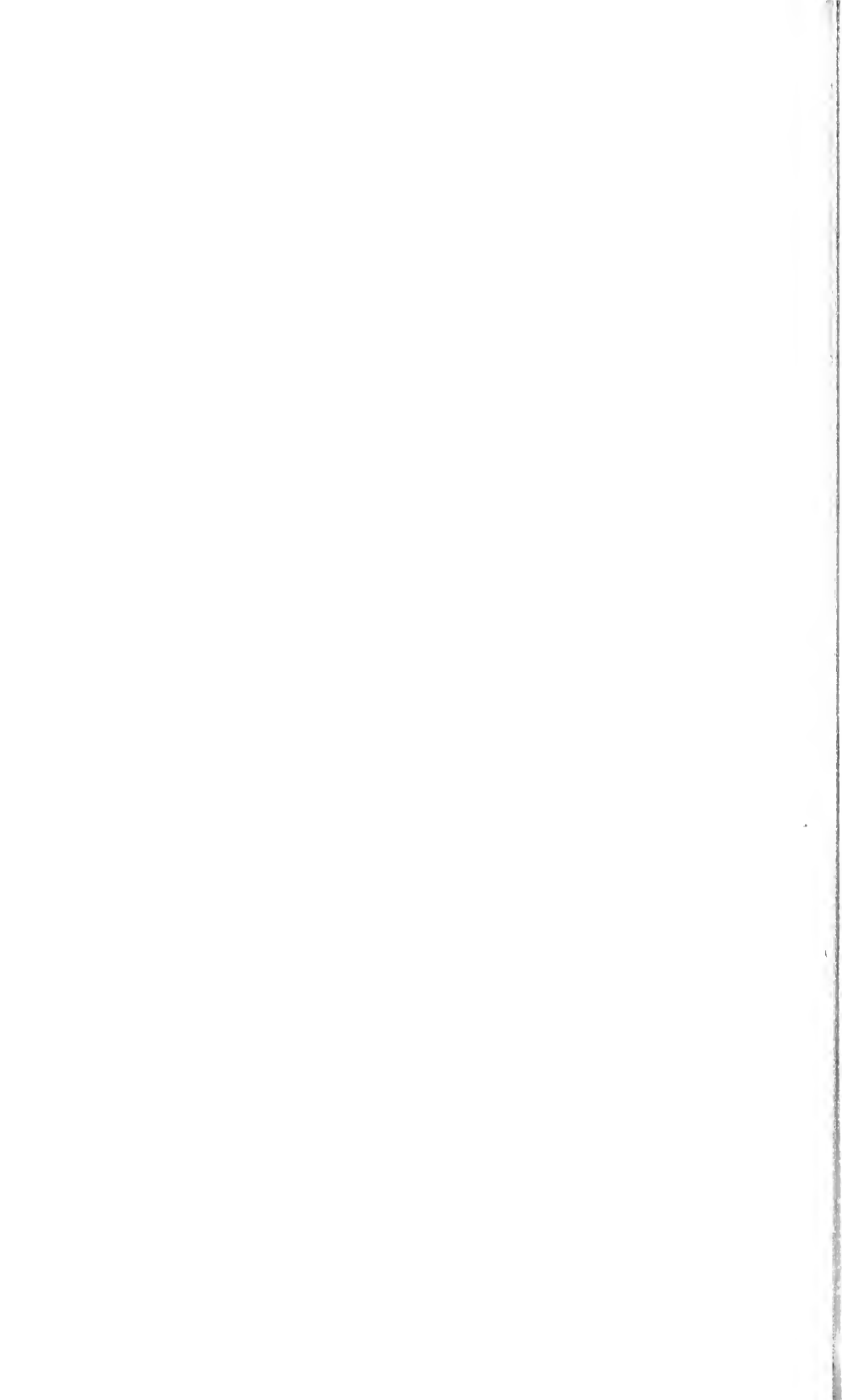


PLATE 12.

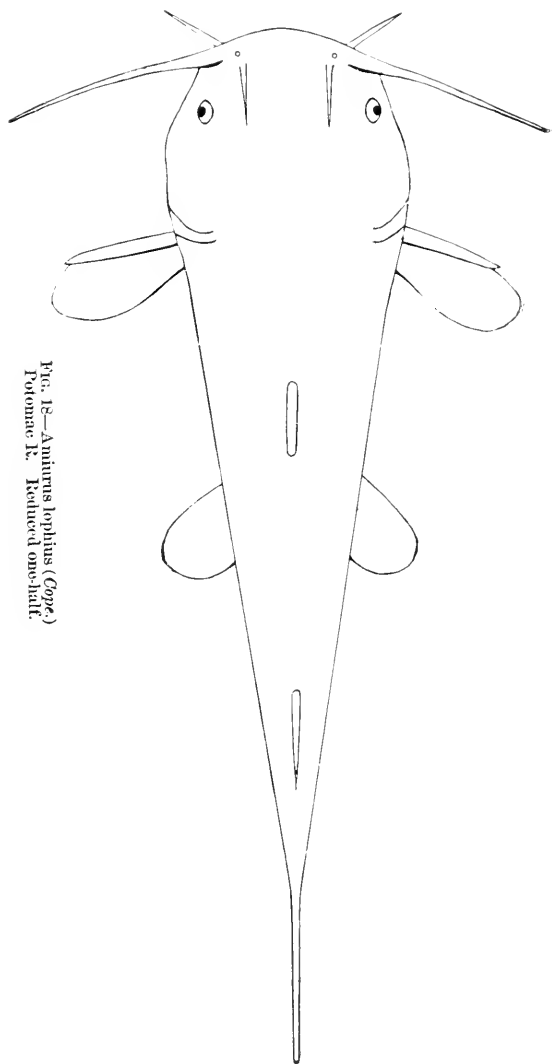
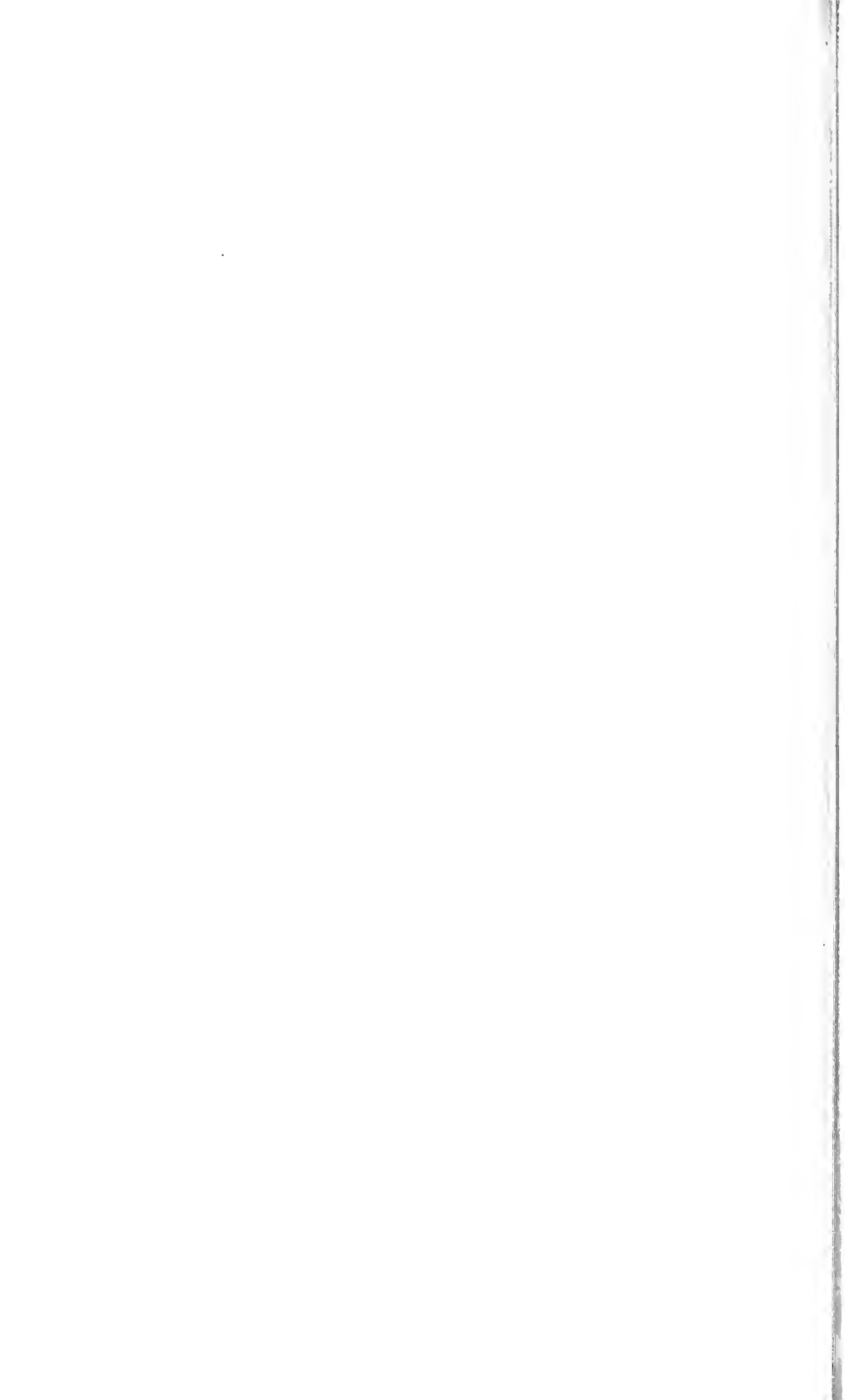


FIG. 12.—*Amiurus lophius* (Cope).
Potomac R. Reduced one-half.



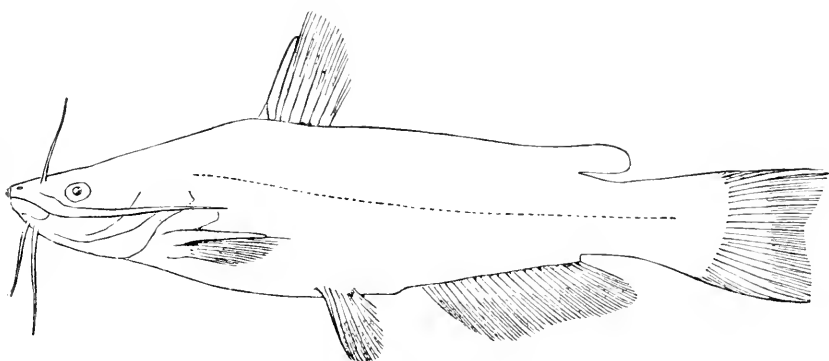


FIG. 19.—*Amiurus erebennus* Jordan.
St. John's R., Fla. From type.

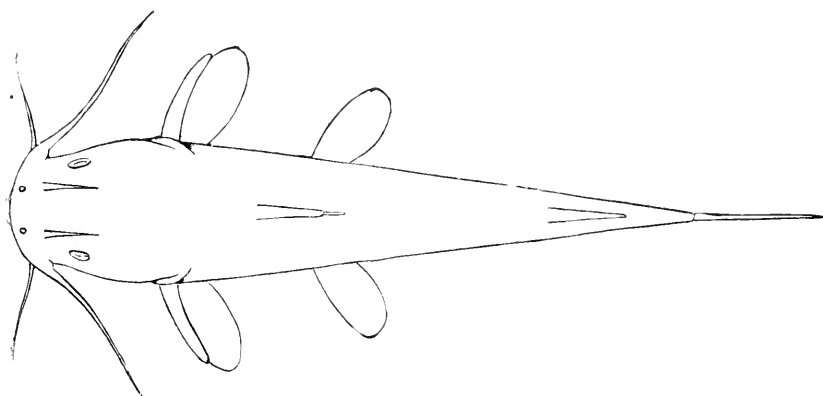


FIG. 20.—*Amiurus erebennus* Jordan.
St. John's R., Fla. From type.

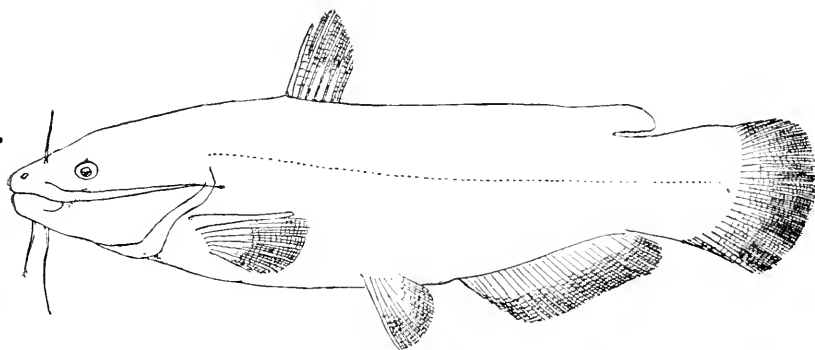


FIG. 21.—*Amiurus natalis* (Le S.) Gill.
(Var. natalis)
Lake Erie.

PLATE 14.

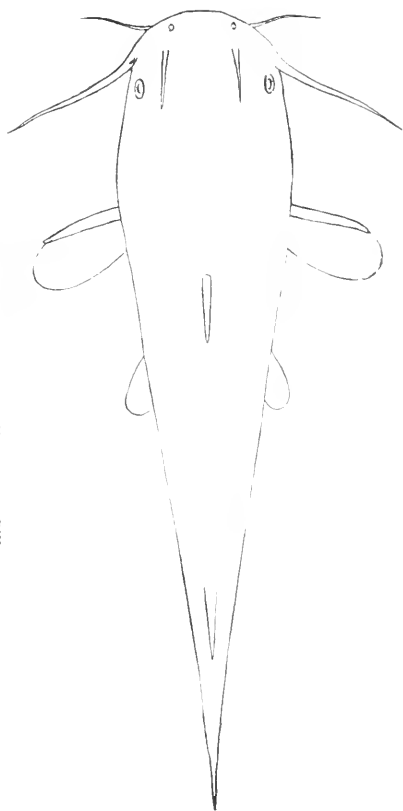


FIG. 22.—*Amiurus natalis* (Le. S.) Gill.
(Var. *natalis*.)
Lake Erie.

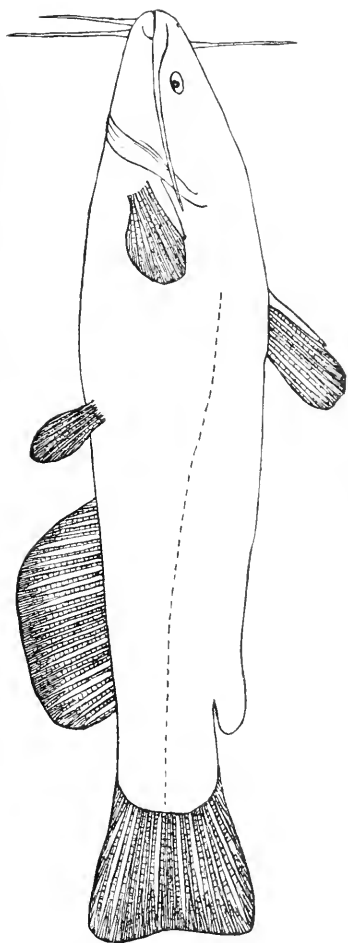


FIG. 23.—*Amiurus natalis lividus* (Jac.) For.
Illinois R. Reduced one-half.

PLATE 15.

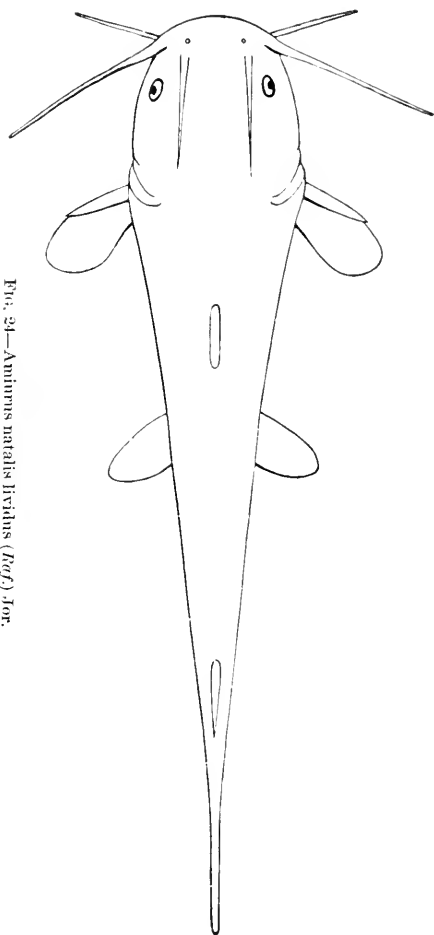


FIG. 24.—*Amiurus natalis lividus* (Raf.) for
Illinois R. Reduced one-half.

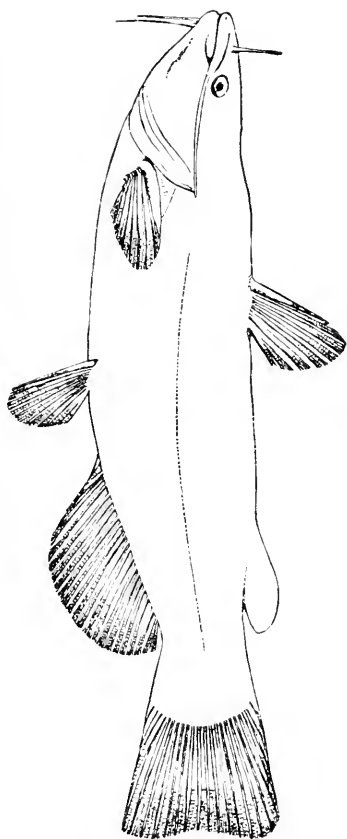


FIG. 24 (b).—*Amiurus natalis lividus* (Raf.) for
Kingston, N. G. Reduced.



PLATE 16.

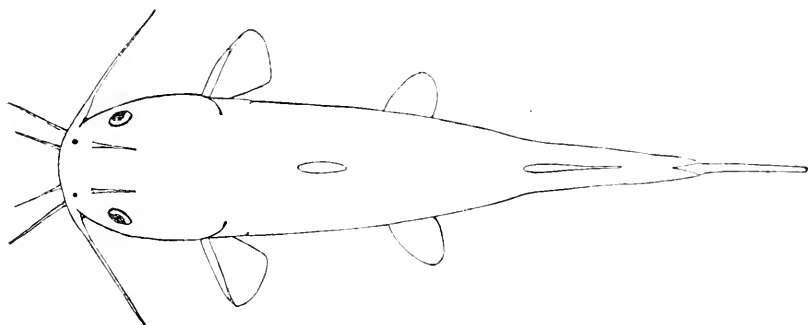


FIG. 24 (c)—*Amiurus natalis lividus* (Ref.) Jor.
Kinston, N. C. Reduced.

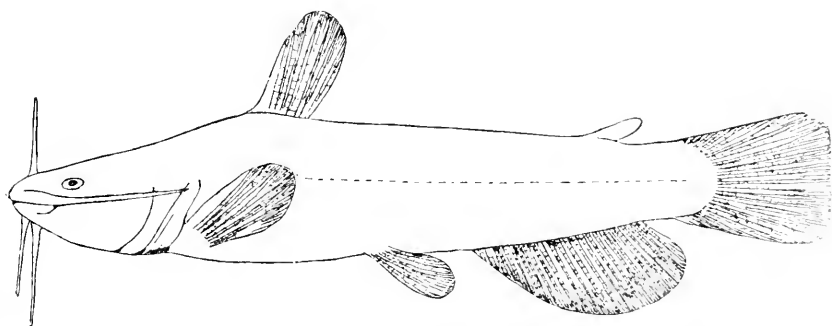


FIG. 25—*Amiurus natalis ctenosus* (Rich.) Jor.
L. Michigan. Reduced one-half.

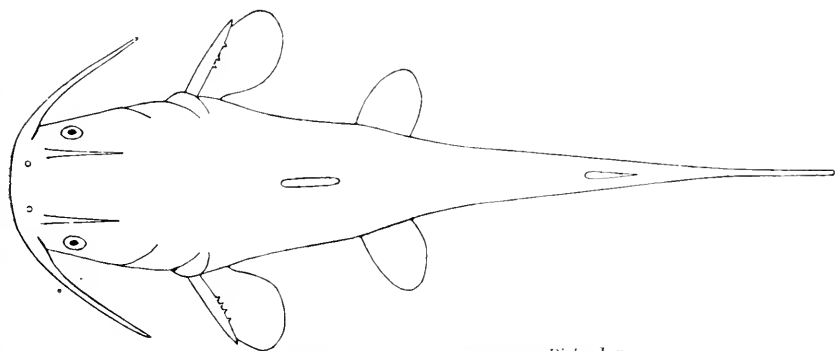


FIG. 26—*Amiurus natalis canosus* (Rich.) Jor.
Lake Michigan. Reduced one-half.



PLATE 17.

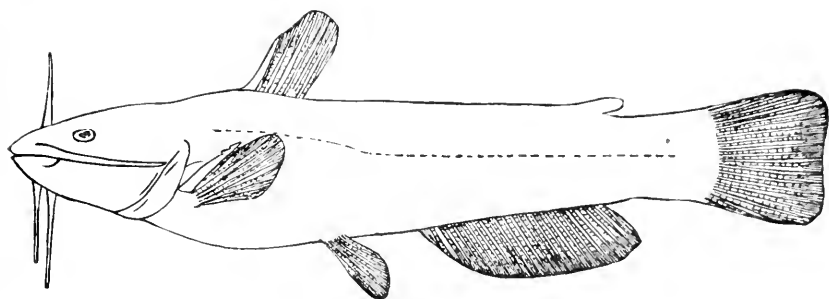
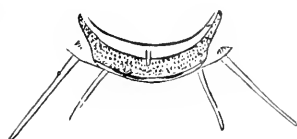


FIG. 27.—*Amiurus natalis cupreus* (Raf.) Jor.
White R., Ind. Reduced one-third.



Dentition lower jaw



Dentition upper jaw.

FIG. 28.—Dentition of *Amiurus natalis cupreus*.

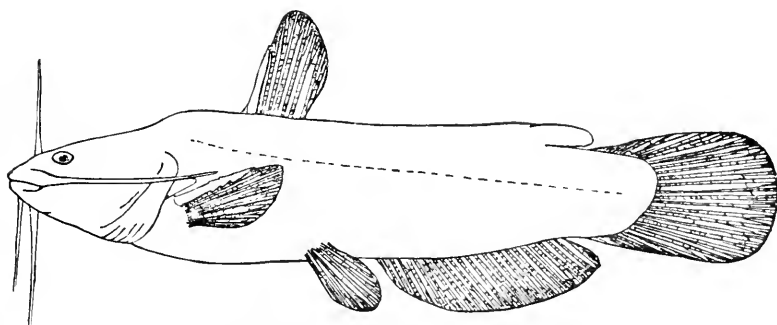


FIG. 29.—*Amiurus natalis antoniensis* (Grd.) Jor.
Etowah R., Ga.

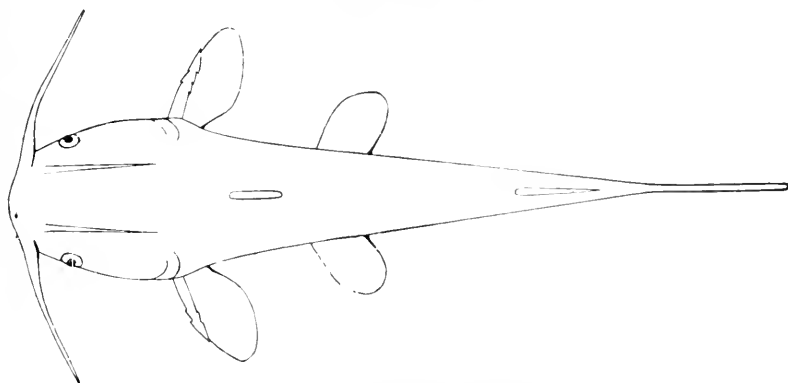


FIG. 30.—*Amiurus natalis antoniensis* (Grd.) Jor.
Etowah River, Georgia.

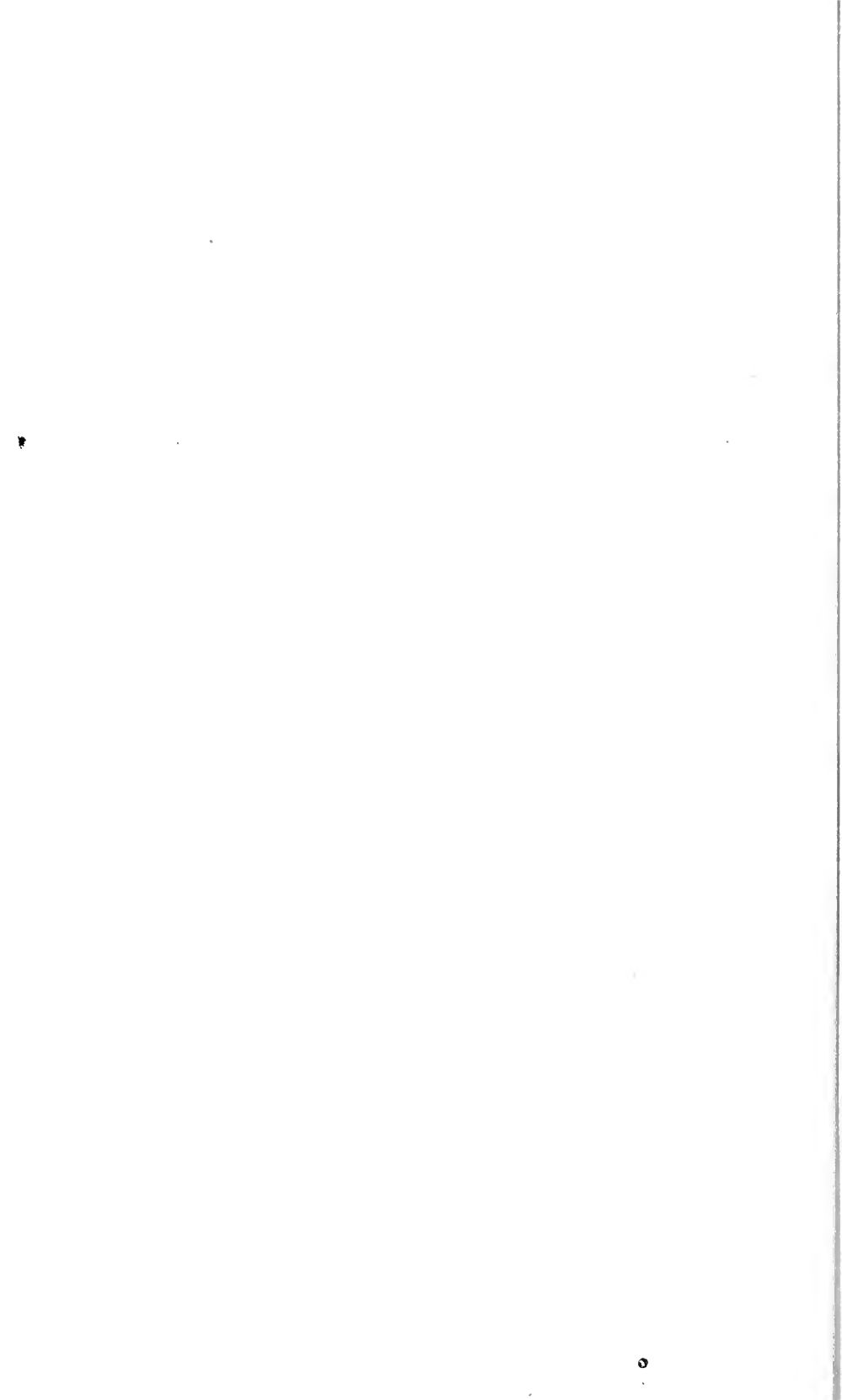


PLATE 18.

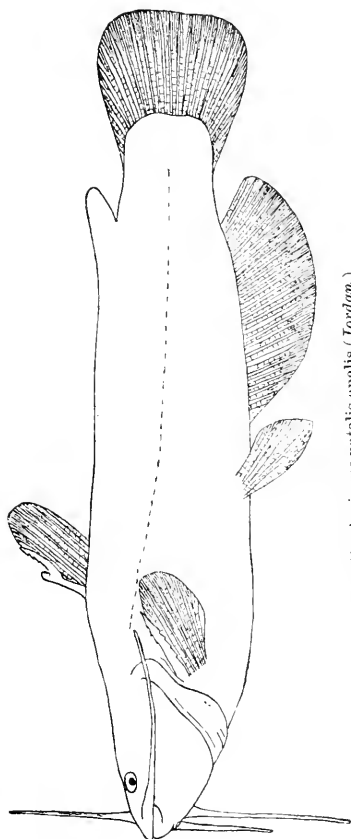


FIG. 31.—*Amiurus natalis analis* (Jordan.)
Little Red K., Ark. Nat. size type.
(Dorsal spine abnormal.)

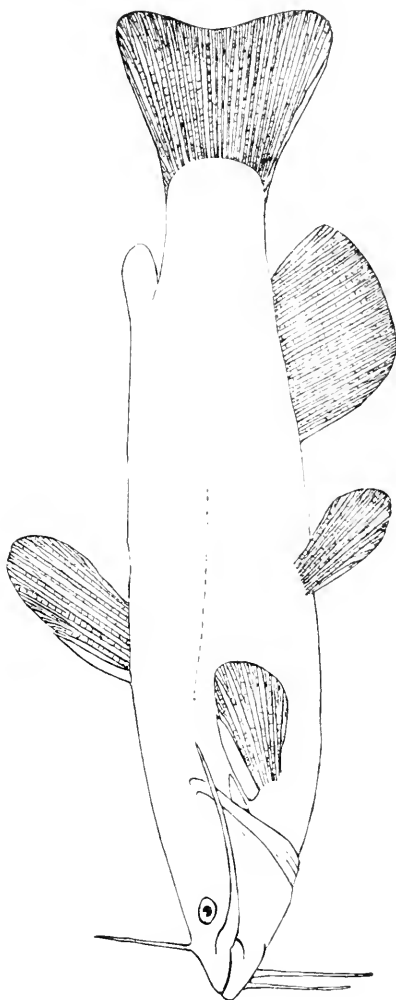


FIG. 32.—*Amiurus vulgaris* (Thompson) Nels.
Lake Michigan. Reduced one-half.

PLATE 19.

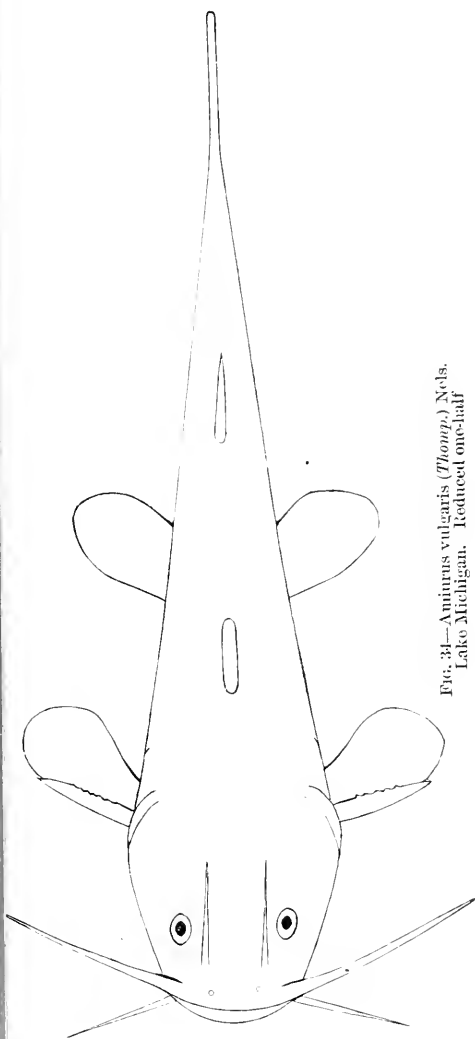


FIG. 34.—*Amiurus vulgaris* (Thompson) Nels.
Lake Michigan. Reduced one-half.

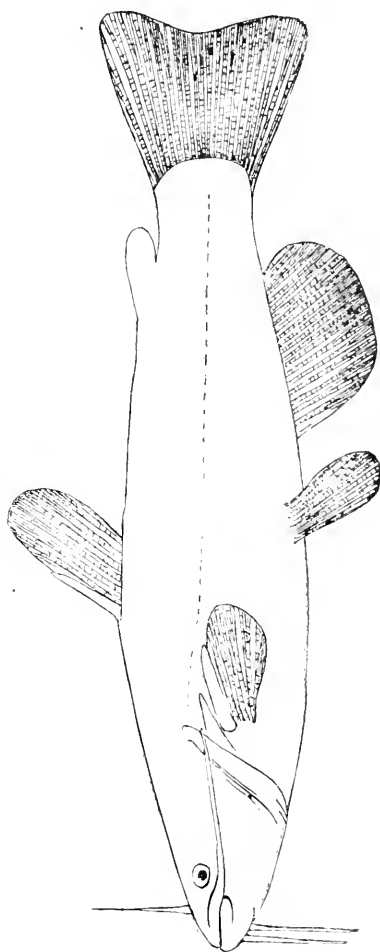


FIG. 35.—*Amiurus vulgaris* (Ford) Jor.
Illinois R. Reduced one-half.

PLATE 20.

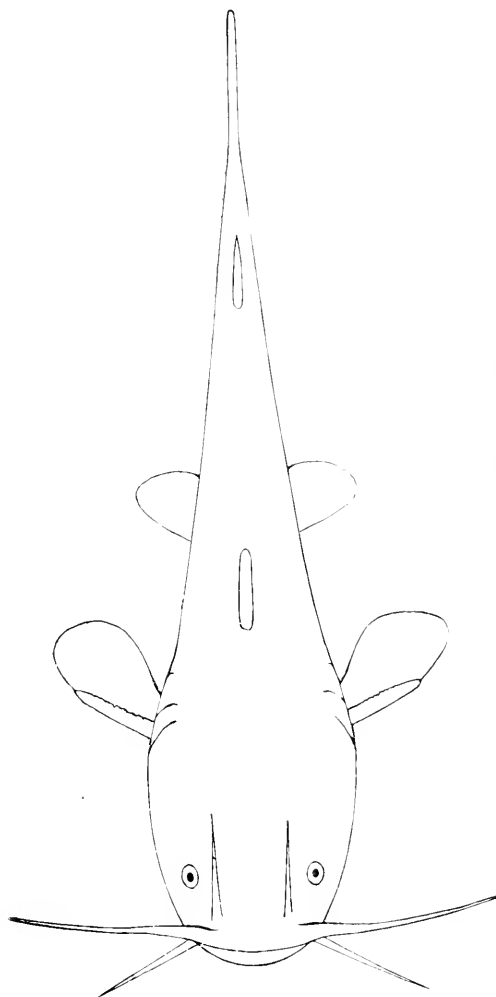


FIG. 35 (b).—*Amiurus vulgaris alpinus* (Grd.) Jor.
Mississippi River. Reduced one half.

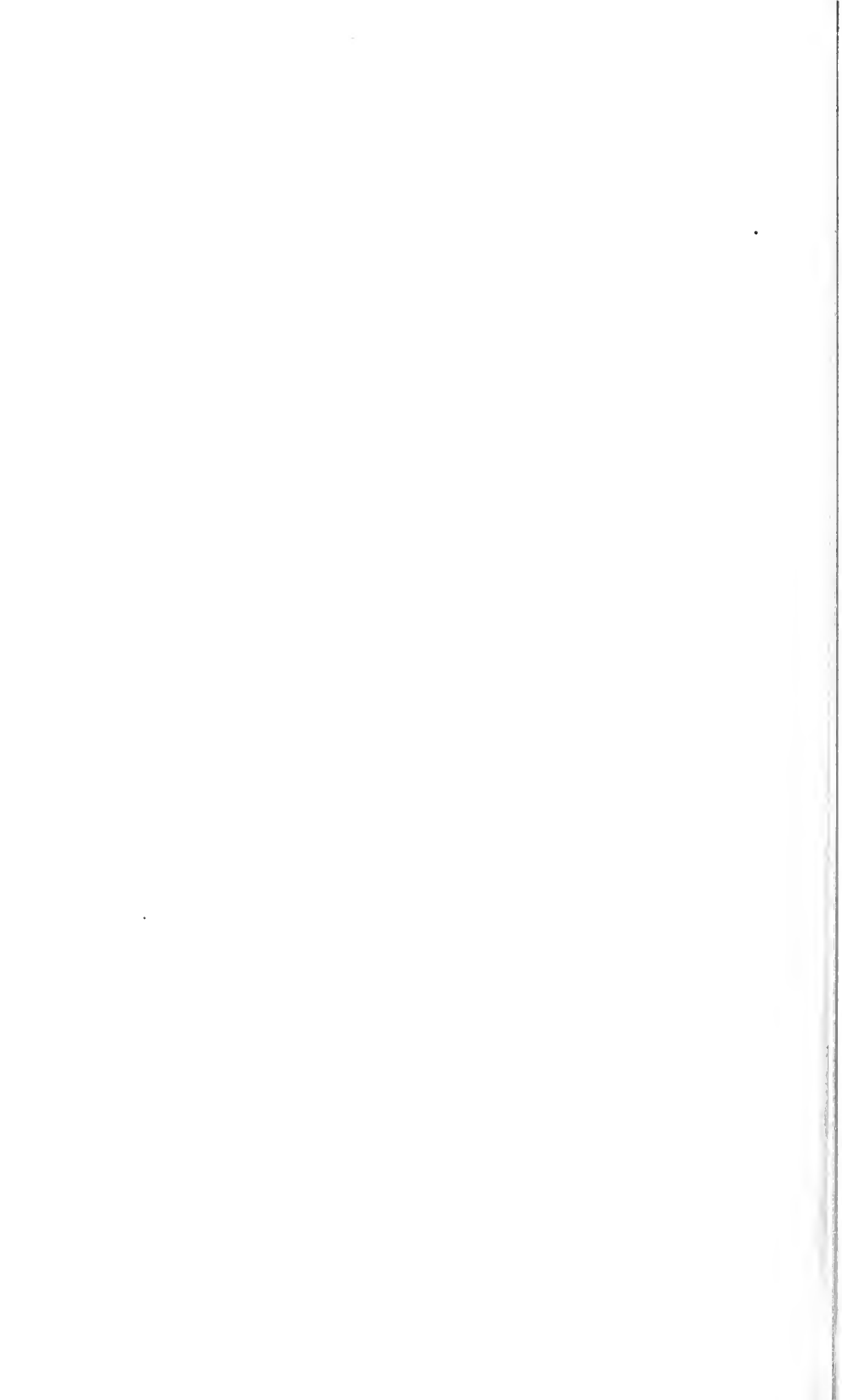


PLATE 21.

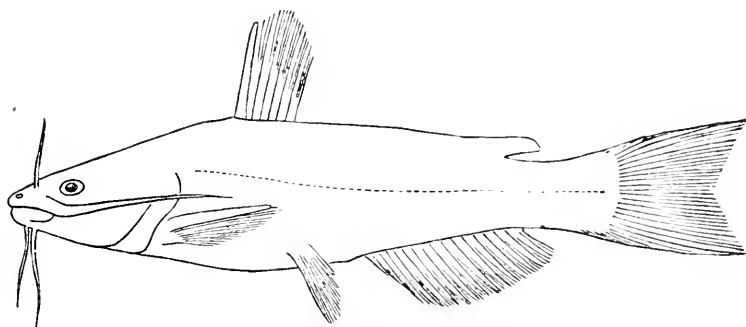


FIG. 36—*Amiurus marmoratus* (Holbr.) Jor.
Altamaha R.

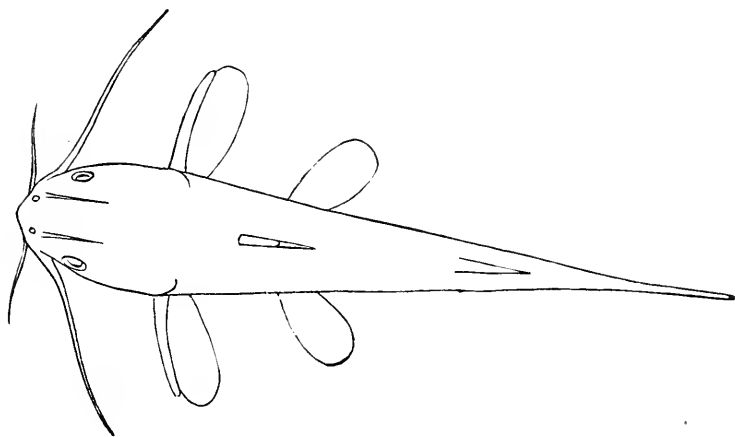


FIG. 37—*Amiurus marmoratus* (Holbr.) Jor.
Altamaha R.

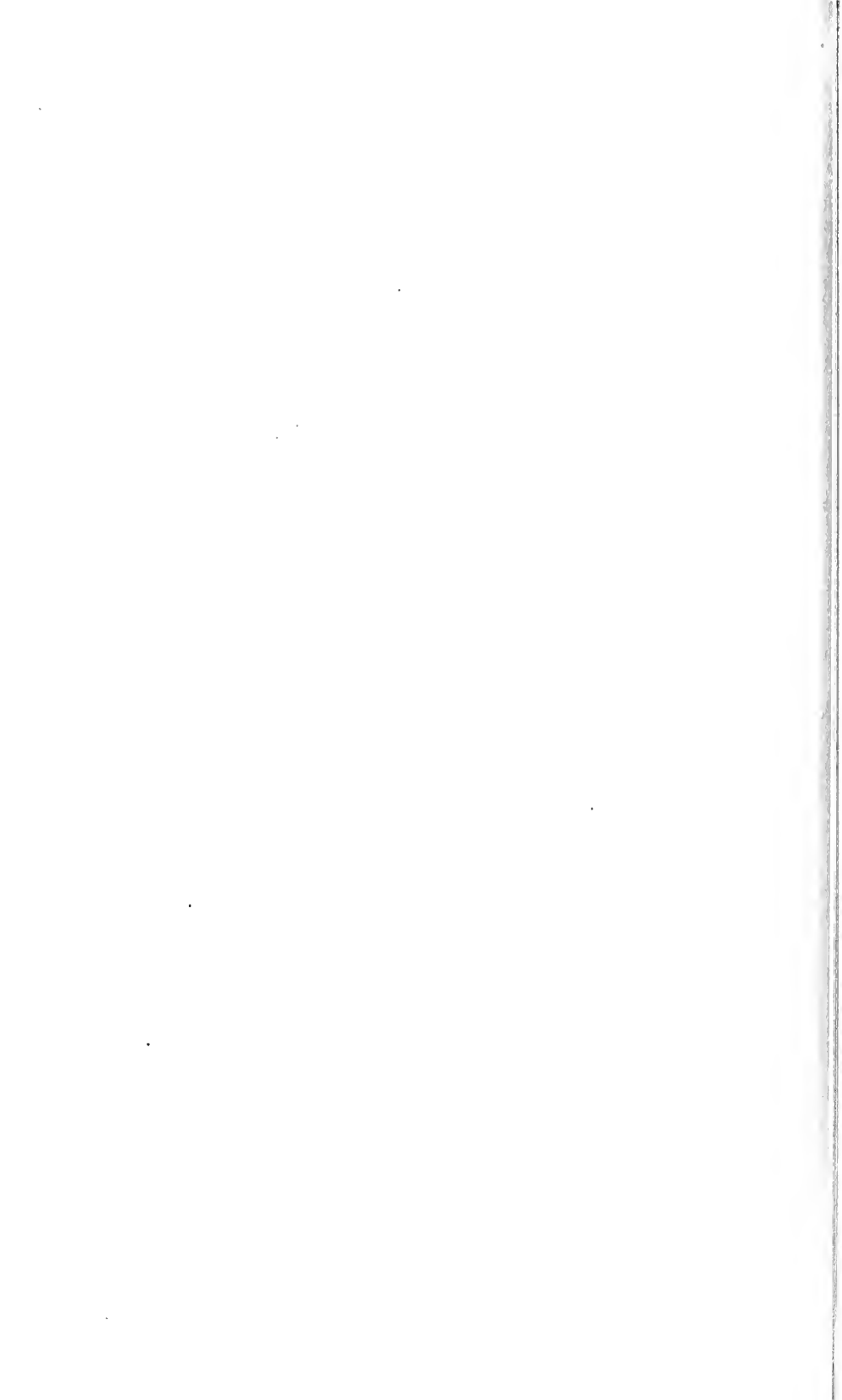


PLATE 22.

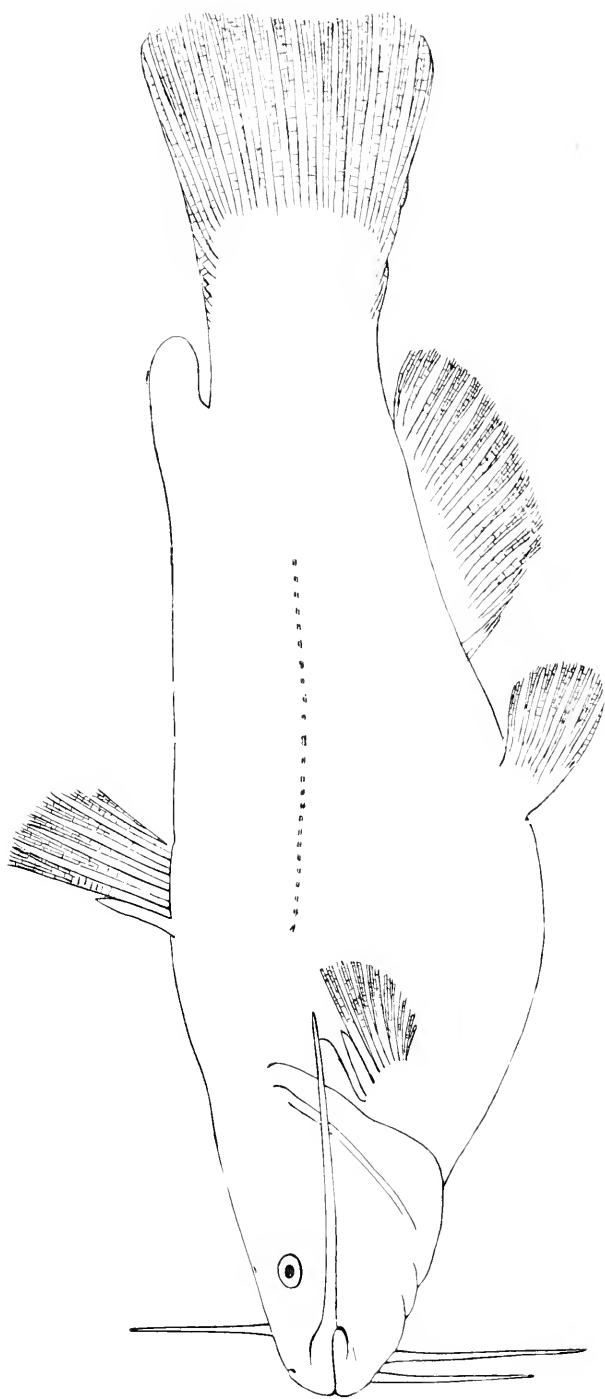
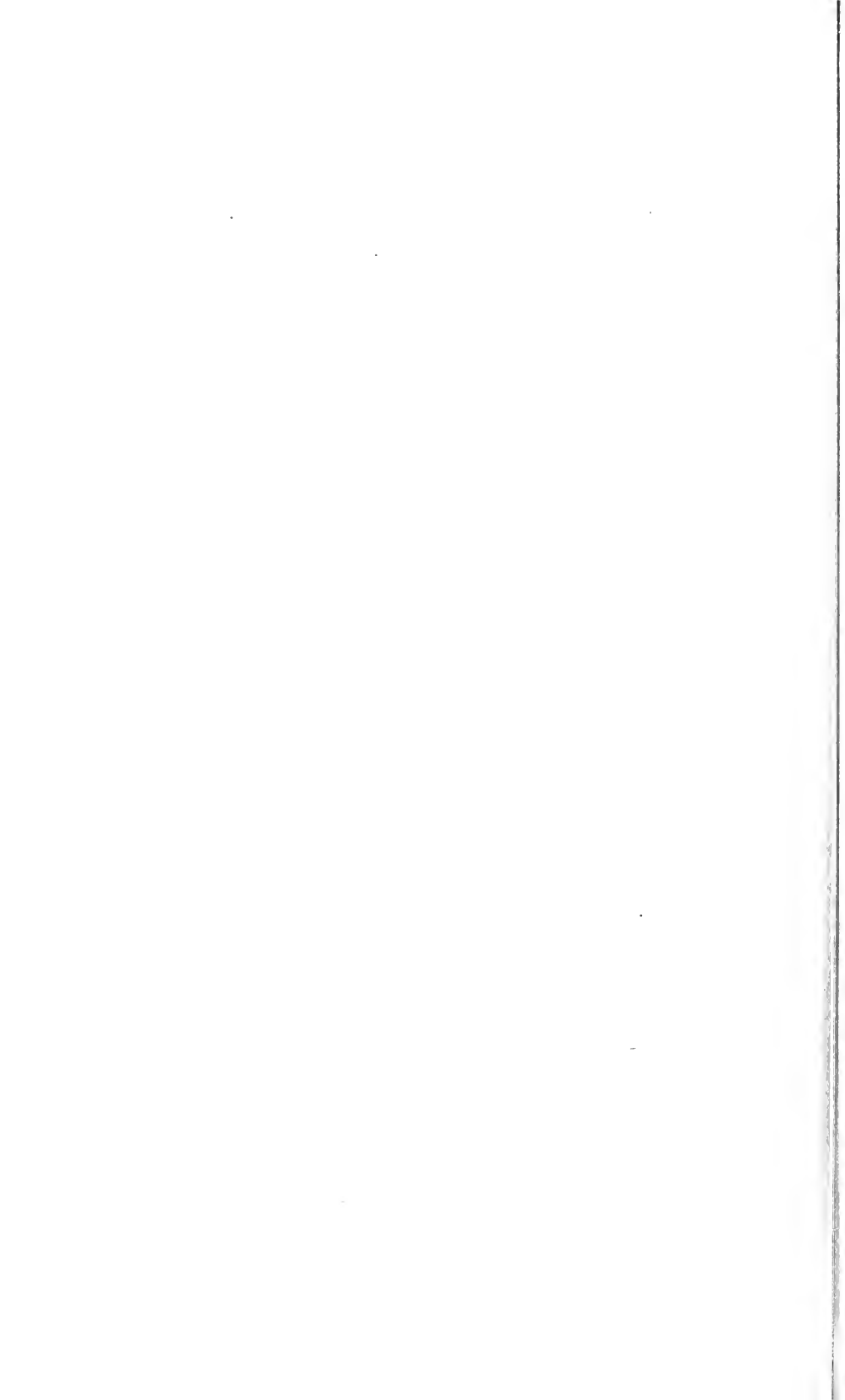


FIG. 3.—*Amia nelsoni* (Berg.) Jordan & Copeland.
Illinois R. Reduced one-half.



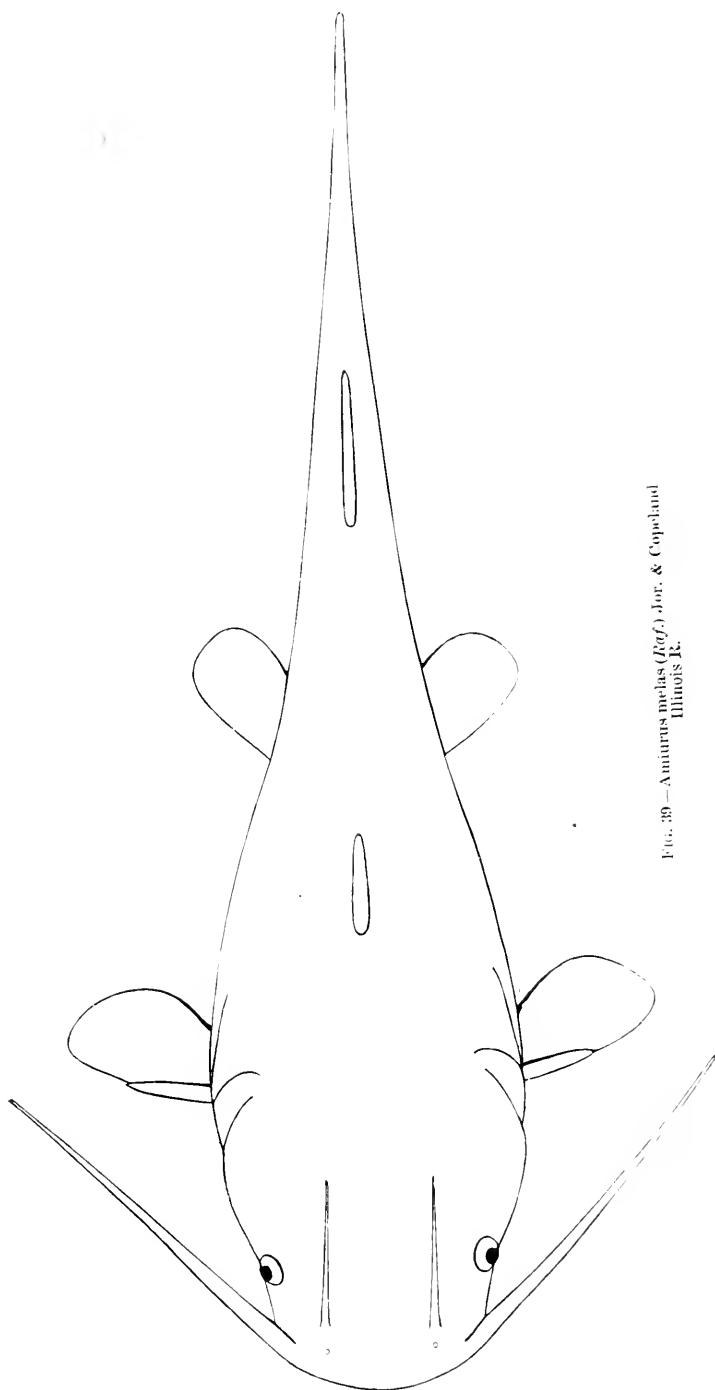


FIG. 39.—*Amiurus melas* (Raf.) Jor. & Copeland
Illinois R.

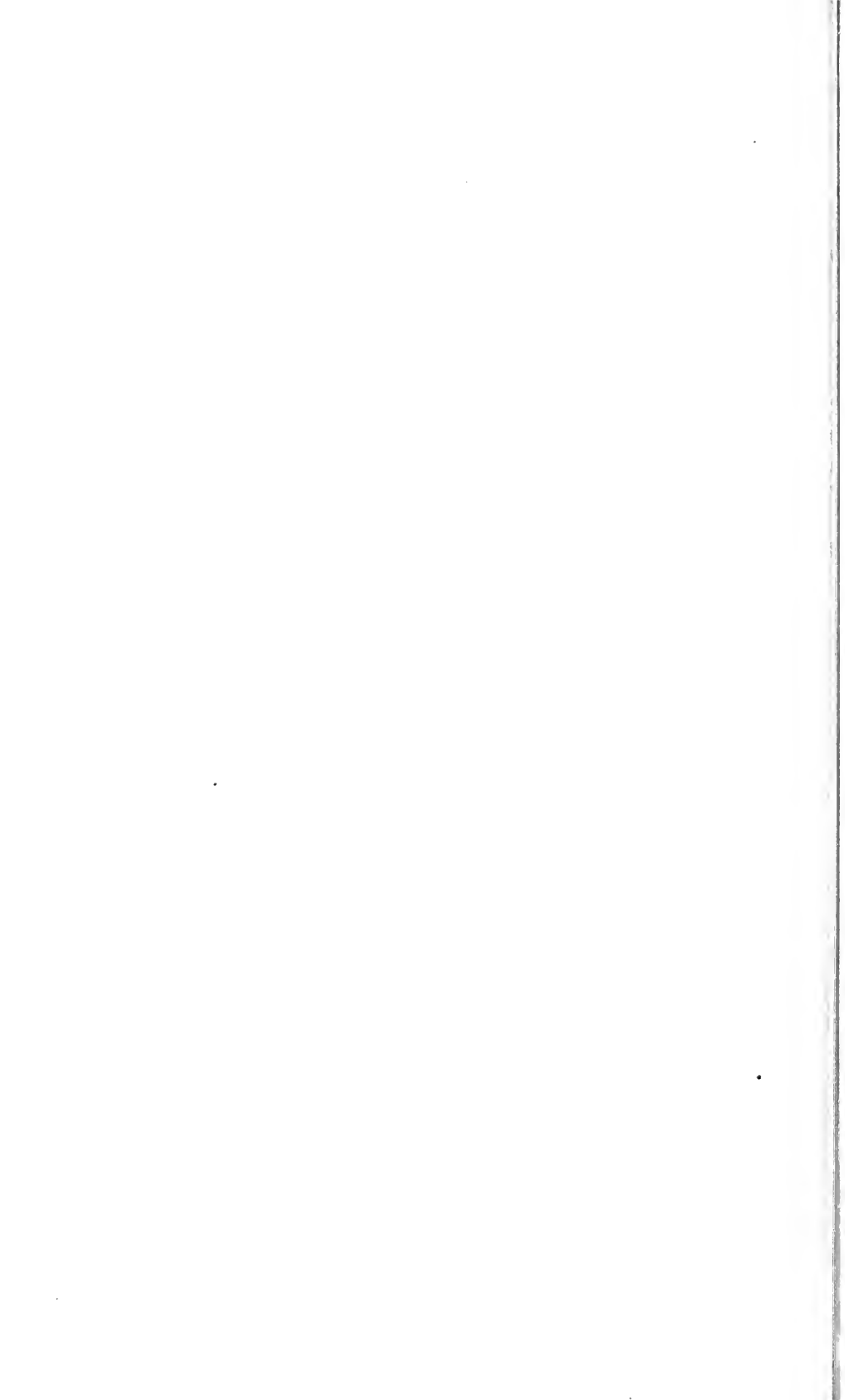


PLATE 24.

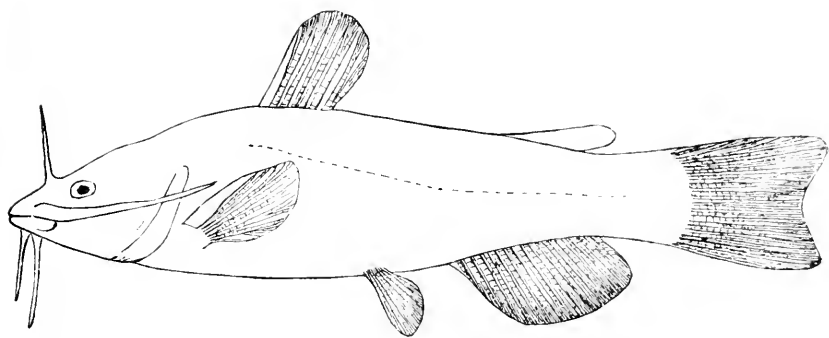


FIG. 39 (b)—*Amiurus melas* (Raf.) Jor. & Copeland
Illinois R.

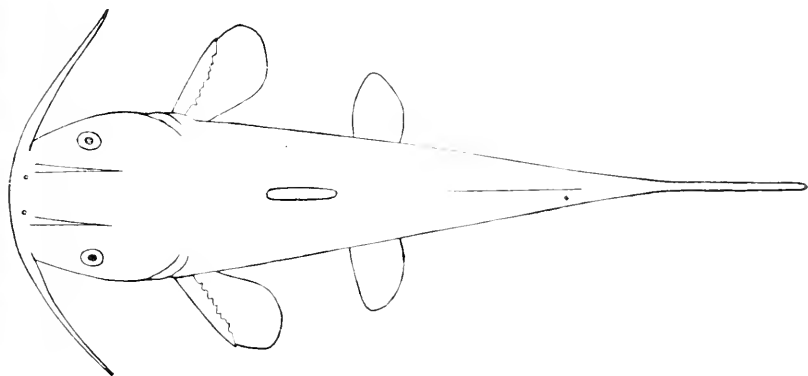
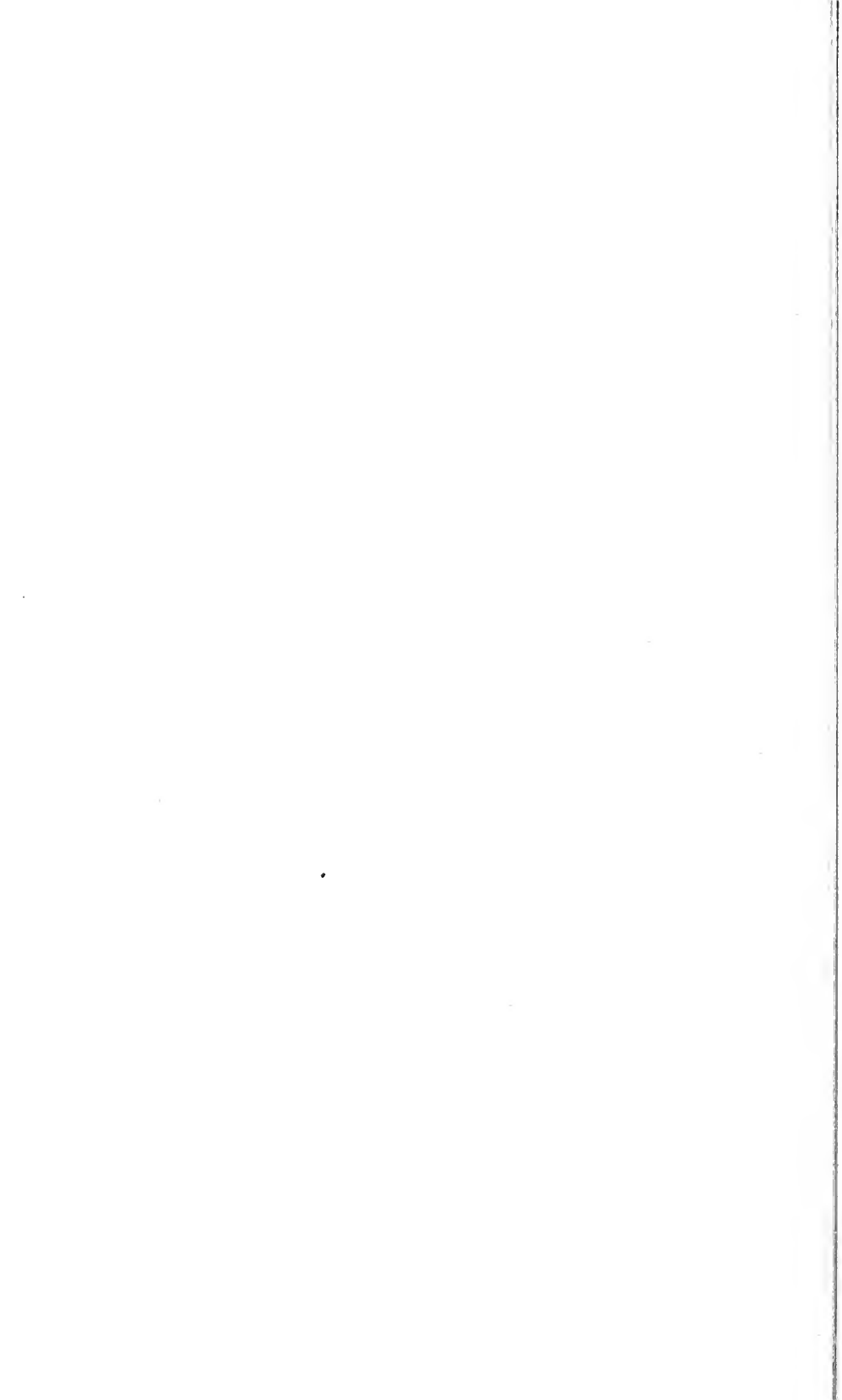


FIG. 39 (c)—*Amiurus melas* (Raf.) Jor. & Copeland.
Illinois R. Reduced one-half.



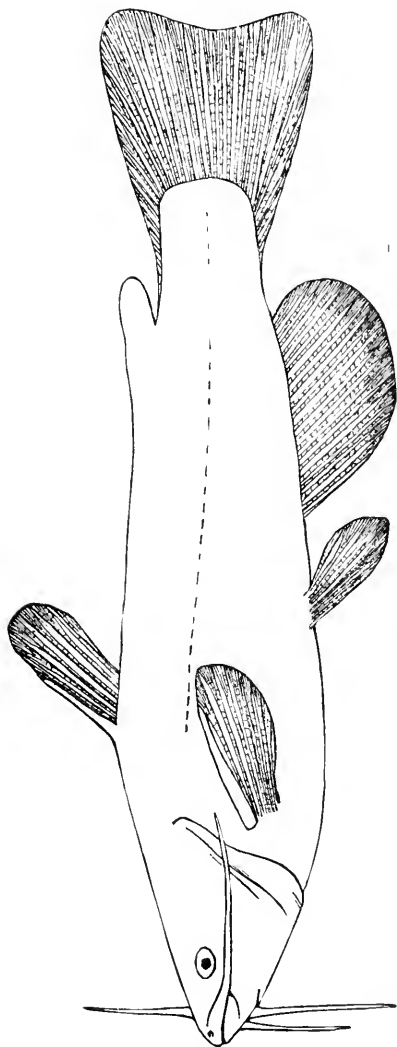


FIG. 40.—*Amia catus* (L.) Gill.
Delaware R.

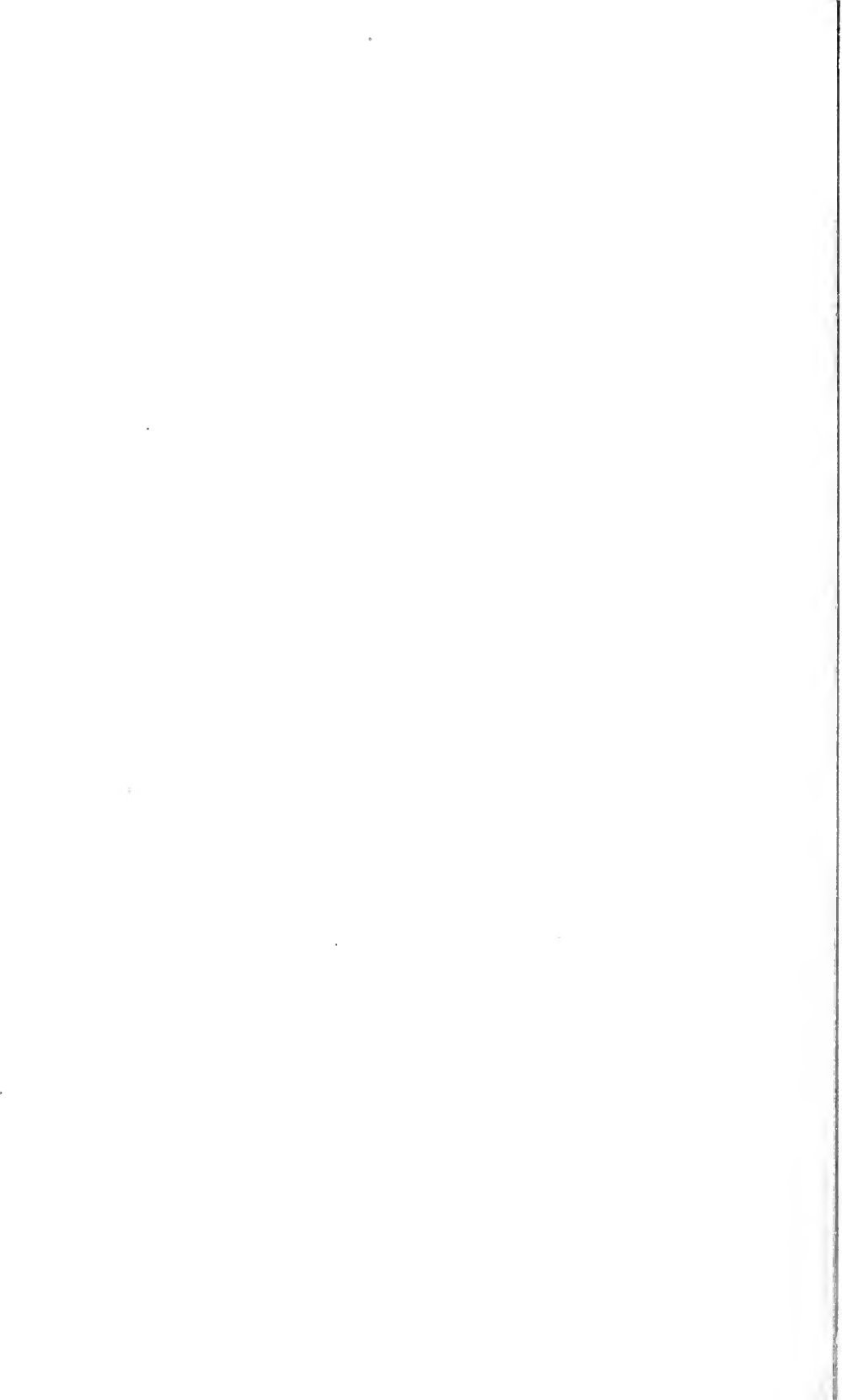


PLATE 26.

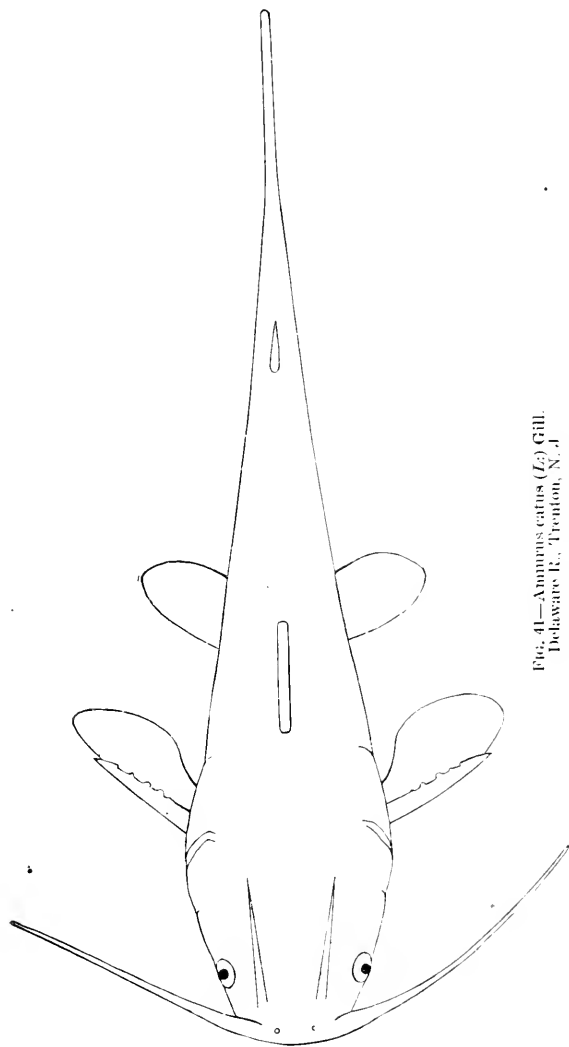


FIG. 41.—*Ammurus catus* (L₂) Gill.
Delaware R., Trenton, N. J.

PLATE 27.

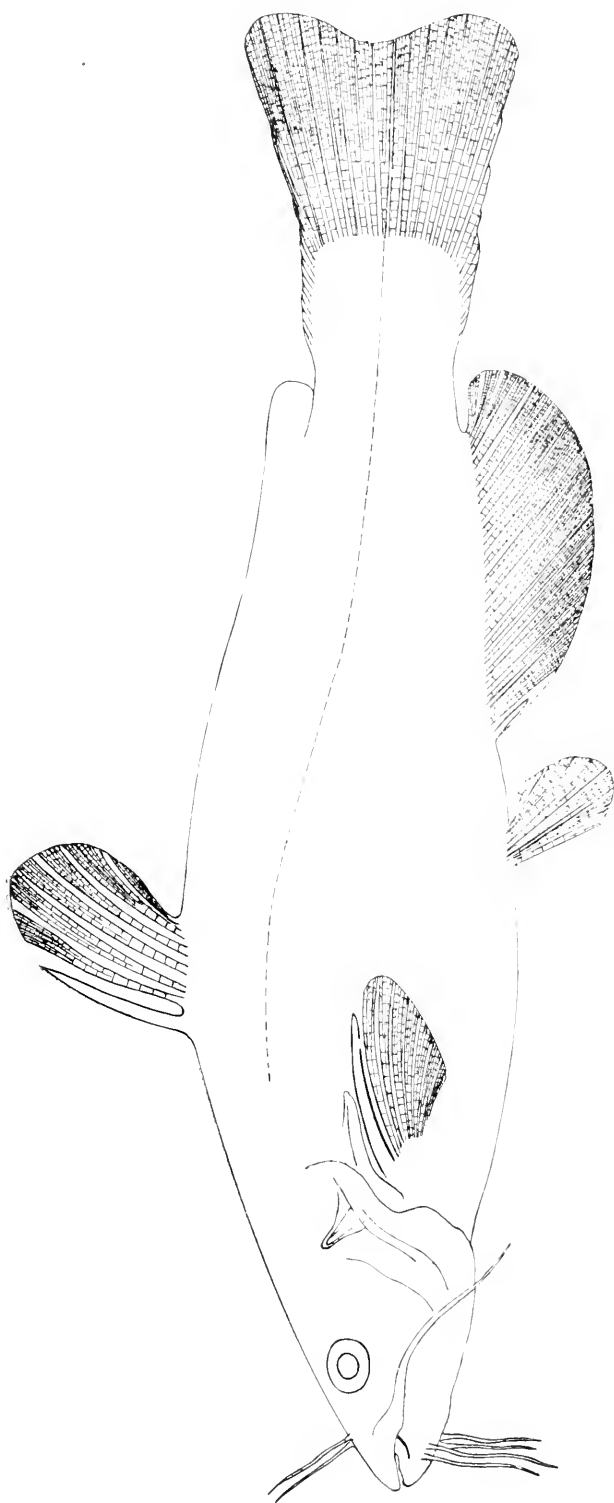


FIG. 41 (b).—*Amia nassii missillensis* (Cope.)
Missill Creek, Delaware. Nat. size from types

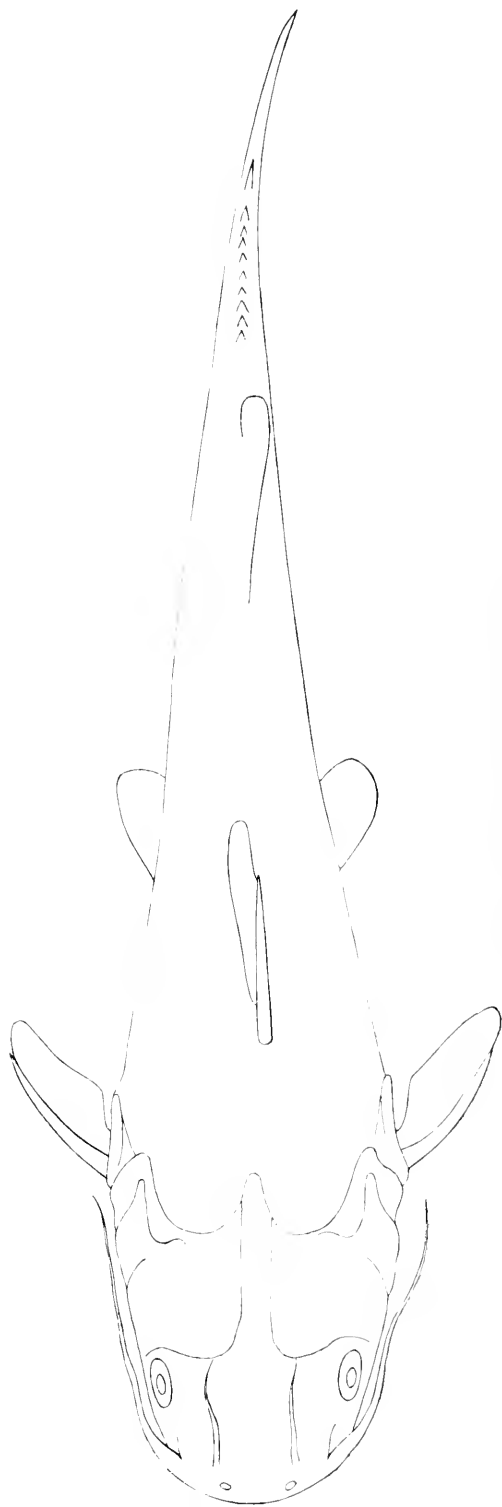


FIG. 41 (c).—*Anurus mispiliensis* (Cope.)
Mispillion Creek, Delaware. Nat. size from types.

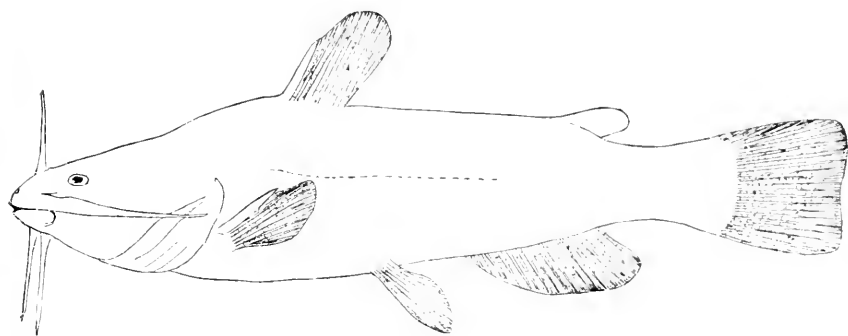


FIG. 42—*Amiurus xanthocephalus* Raf. Gill.
White R., Ind. Reduced one-half.

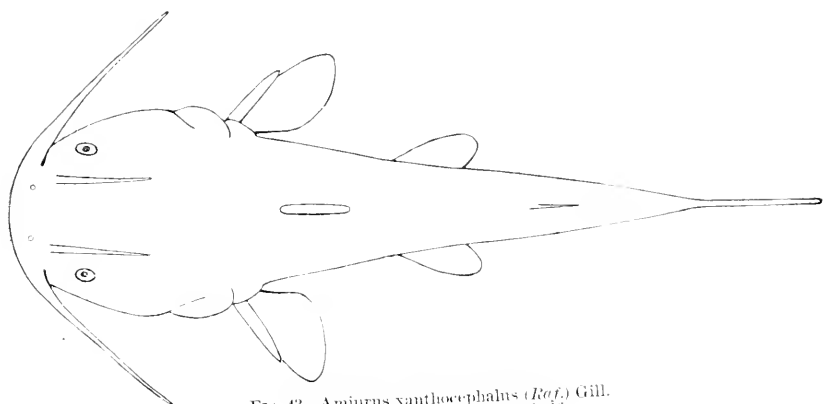


FIG. 43—*Amiurus xanthocephalus* (Raf.) Gill.
White R., Ind. Reduced one-half.

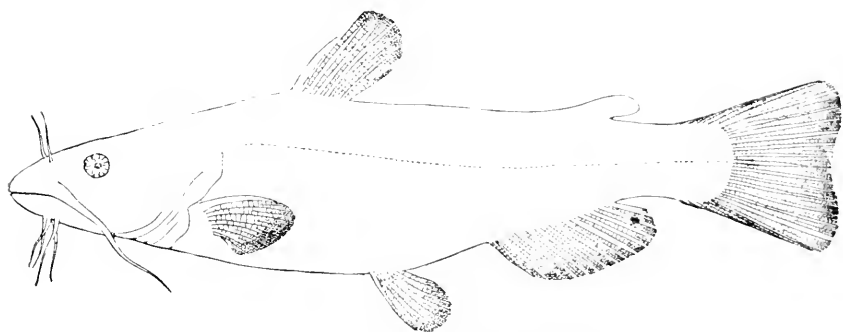


FIG. 44—*Amiurus nigrilabris* (Cope) Gill & Jordan.
Conestoga Creek, Pa. (From type)

PLATE 30.

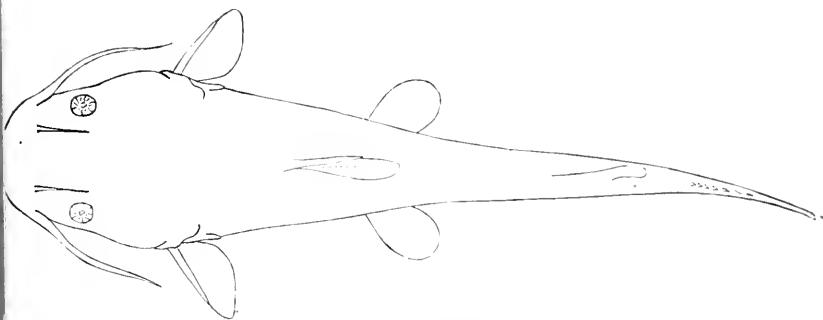


FIG. 45.—*Amiurus nigrilabris* (Cope) Gill & Jordan.
Cone-toga Creek, Pa. (From type.)

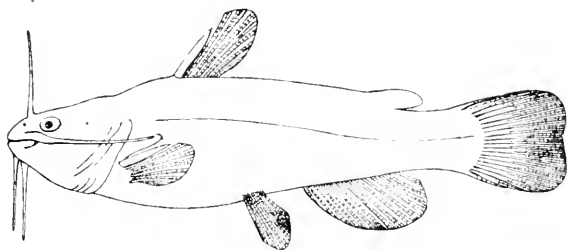


FIG. 46.—*Amiurus pullus* (Dekay) Gill.
Genesee R., N. Y. Nat. size.

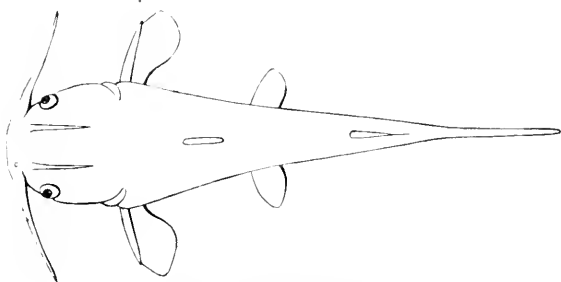


FIG. 47.—*Amiurus pullus* (Dekay) Gill.
Genesee R.

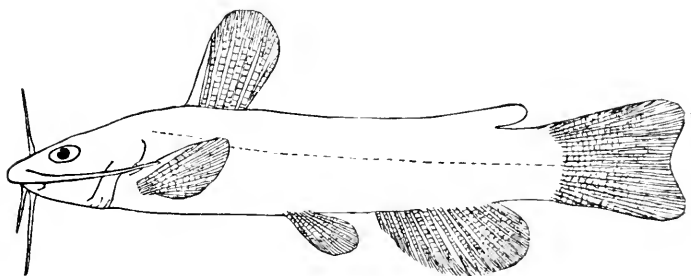


FIG. 48.—*Amiurus brunneus* (Jor.)
Ocmulgee R., Ga. (Type.)

PLATE 31.

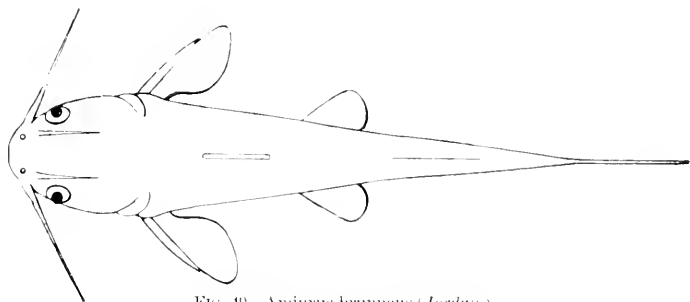


FIG. 48.—*Amiurus brunneus* (Jordan.)
Ocmulgee R., Ga. From types.

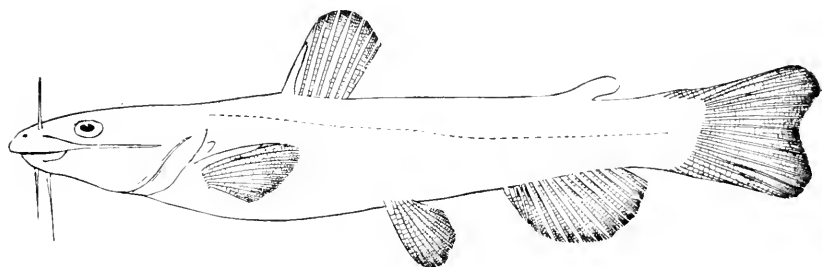


FIG. 49 (b)—*Amiurus brunneus*, Jordan.
(Adult.) Saluda River, S. C. Reduced one-half.

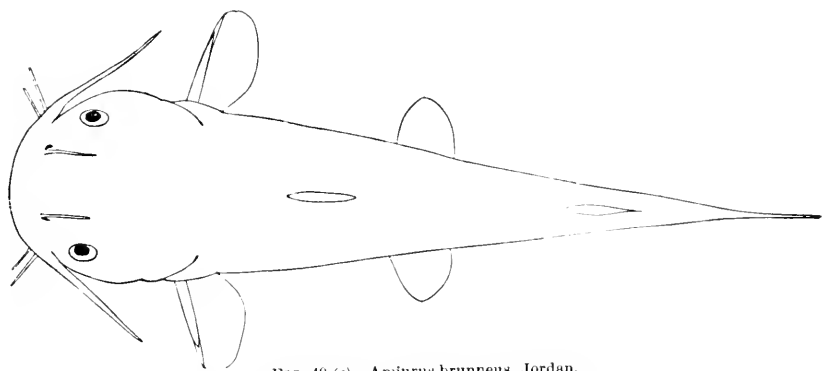


FIG. 49 (c)—*Amiurus brunneus*, Jordan.
(Adult.) Saluda River, S. C. Reduced one-half.

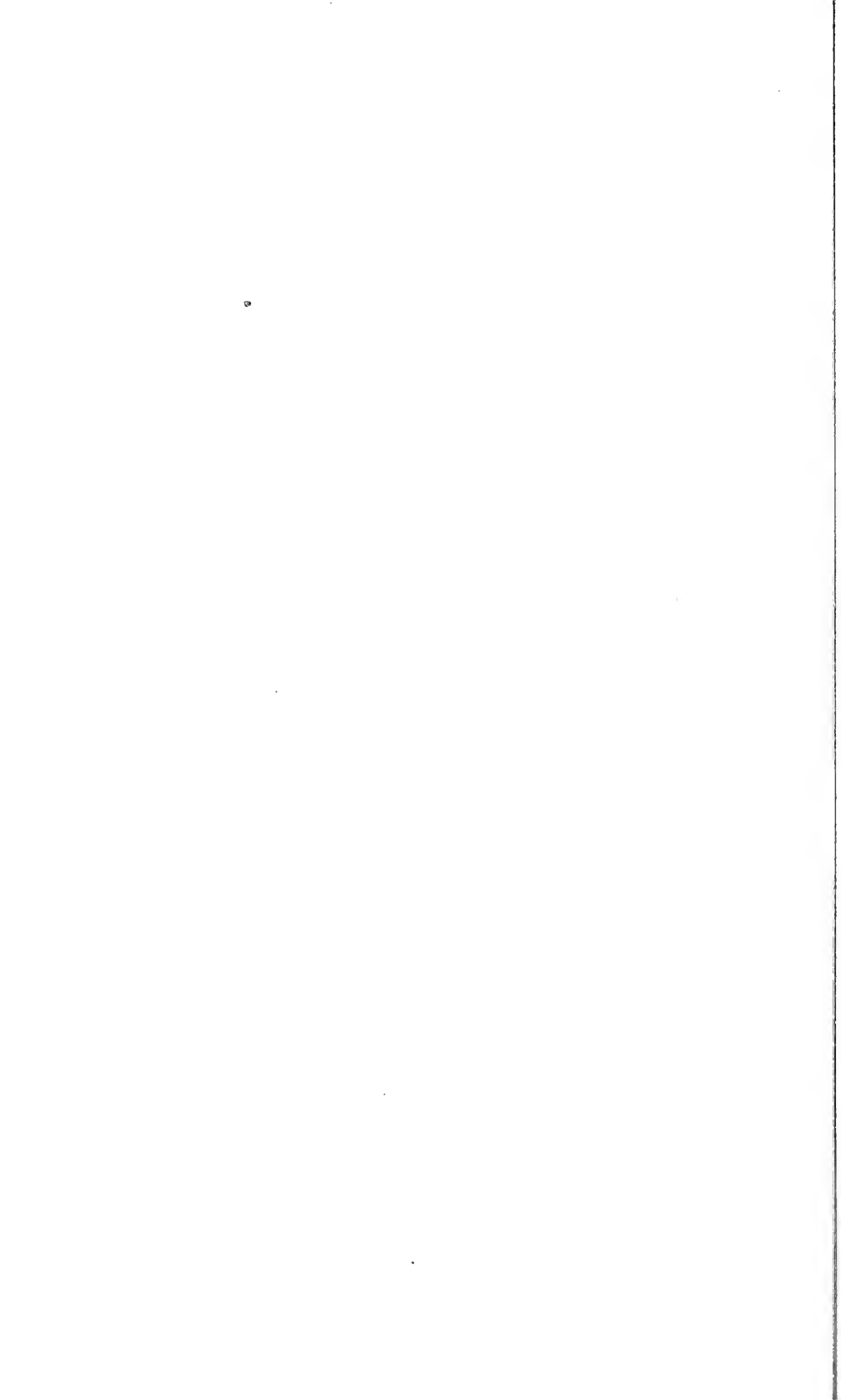


PLATE 32.

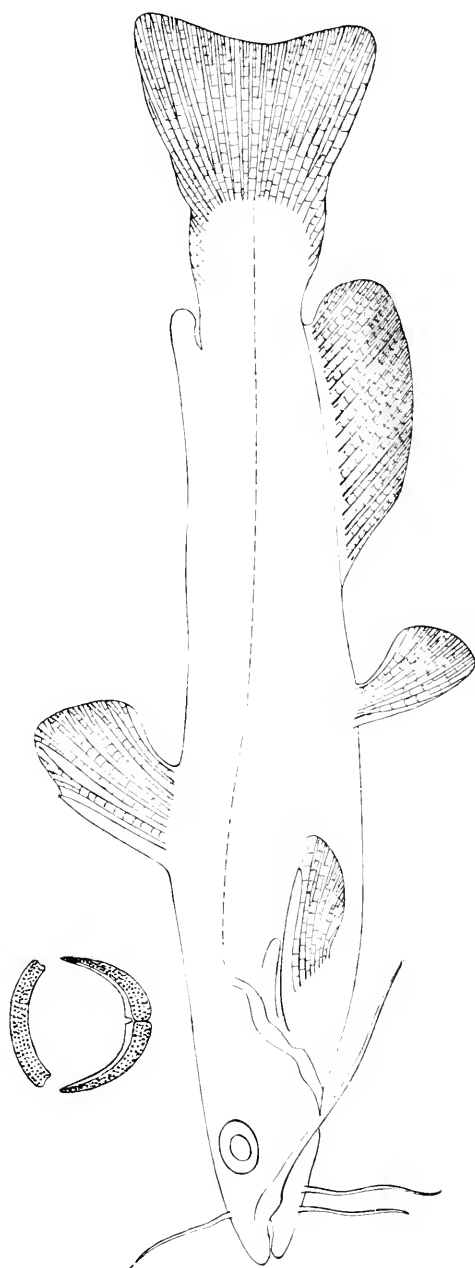
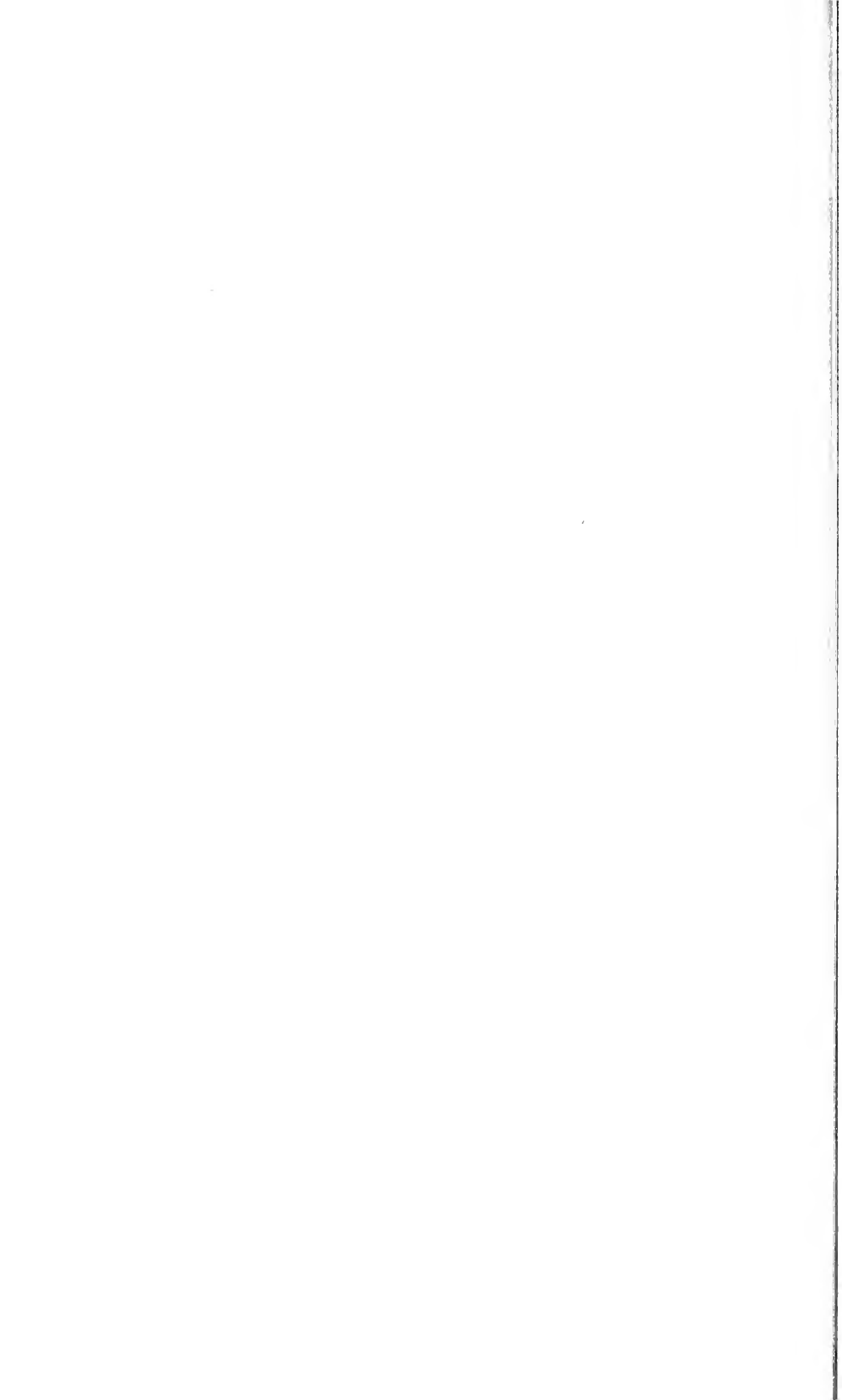


FIG. 50.—*Amiaus platycephalus* (Gill).
North Carolina



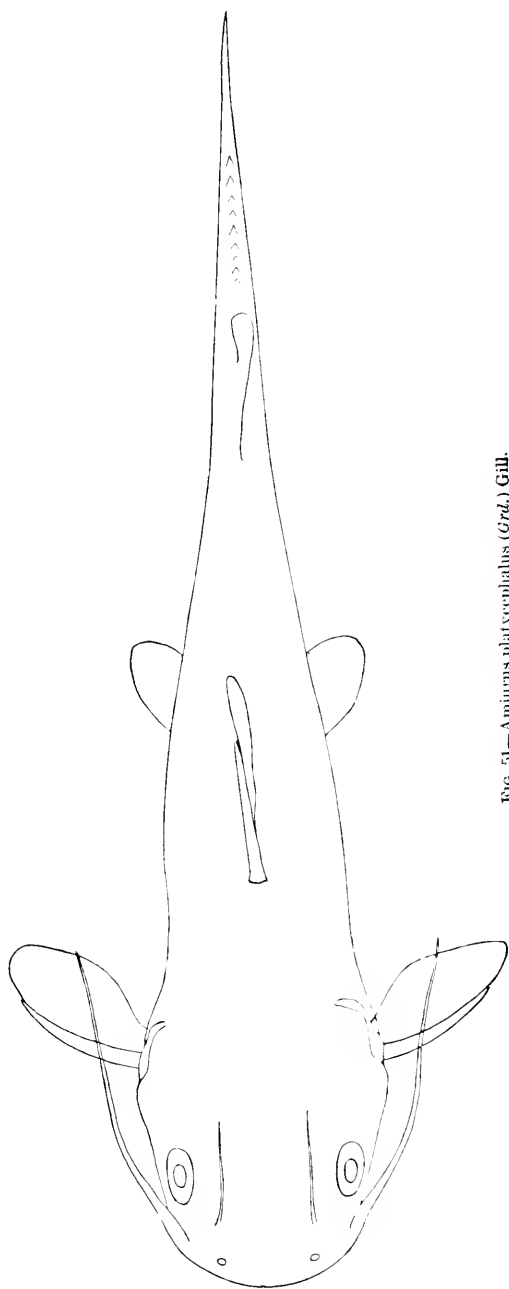


FIG. 51.—*Amicus platycephalus* (Grd.) Gill.
North Carolina.

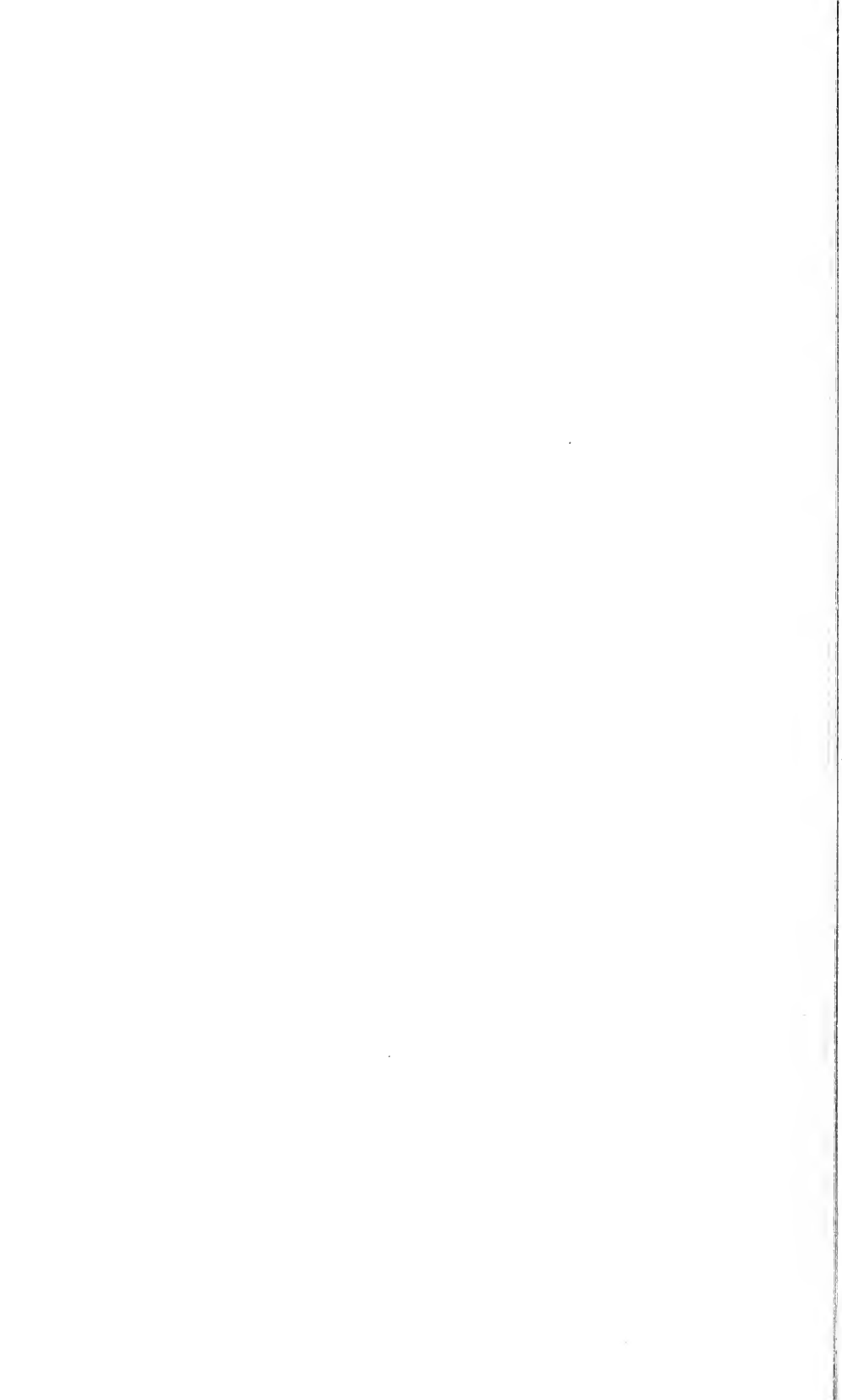


PLATE 34.

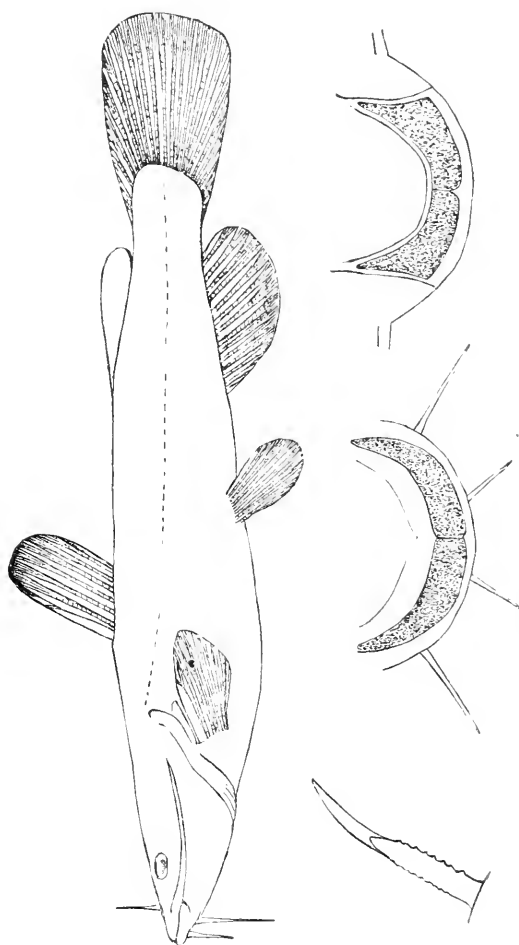


FIG. 52.—*Petodichthys olivaris* (Raf.) G. & J.
French Broad R. Reduced one-half.

PLATE 35.

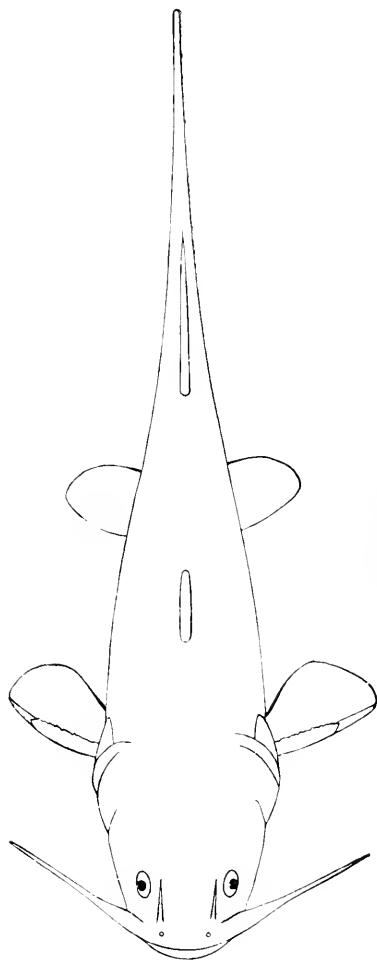


FIG. 53.—*Pelodichthys olivaris* (Zug.) Gill & Jour.
French Broad R. Reduced one-half.

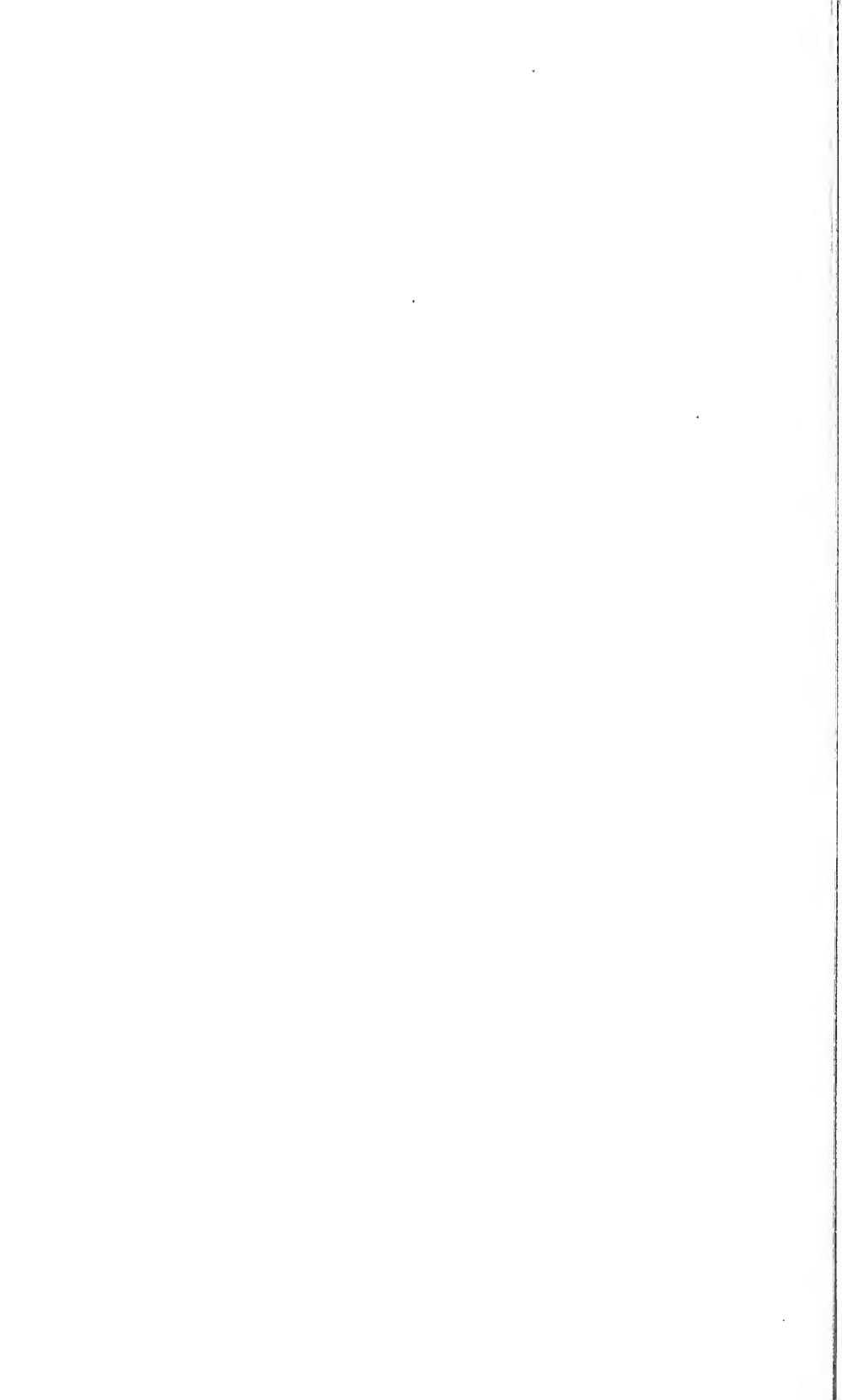
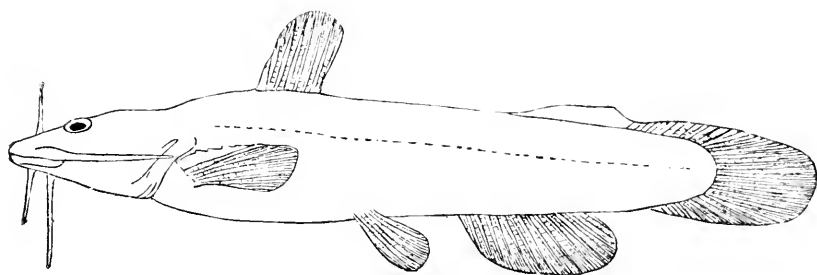


PLATE 36.



Pectoral spine, 2 diams.



Dentition both jaws.



Dentition upper jaw.

FIG. 54—*Noturus flavus* Raf.
Ohio R., W. Va. Reduced one-sixth.

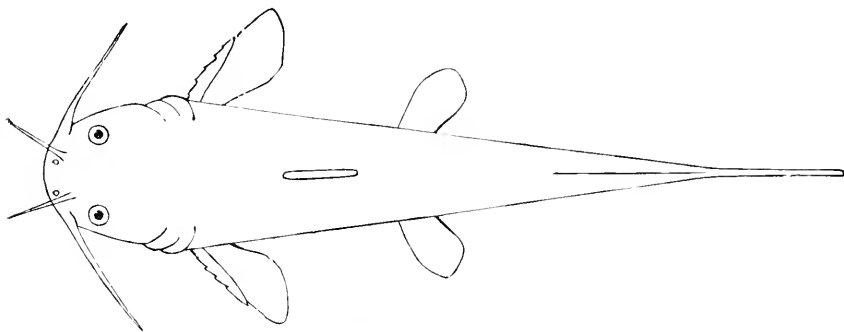


FIG. 55—*Noturus flavus* Raf.
Ohio R., W. Va. Reduced one-sixth.

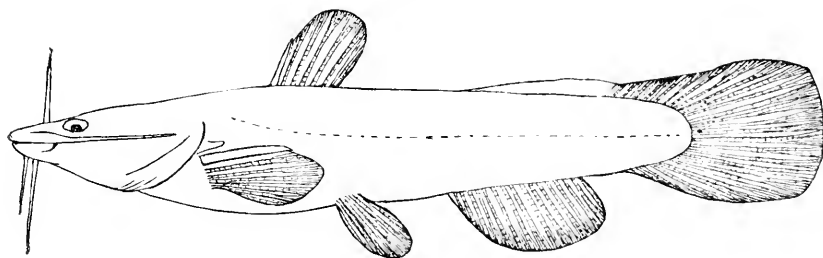


FIG. 56—*Noturus insignis* (Rich) G. & J.
Penna.

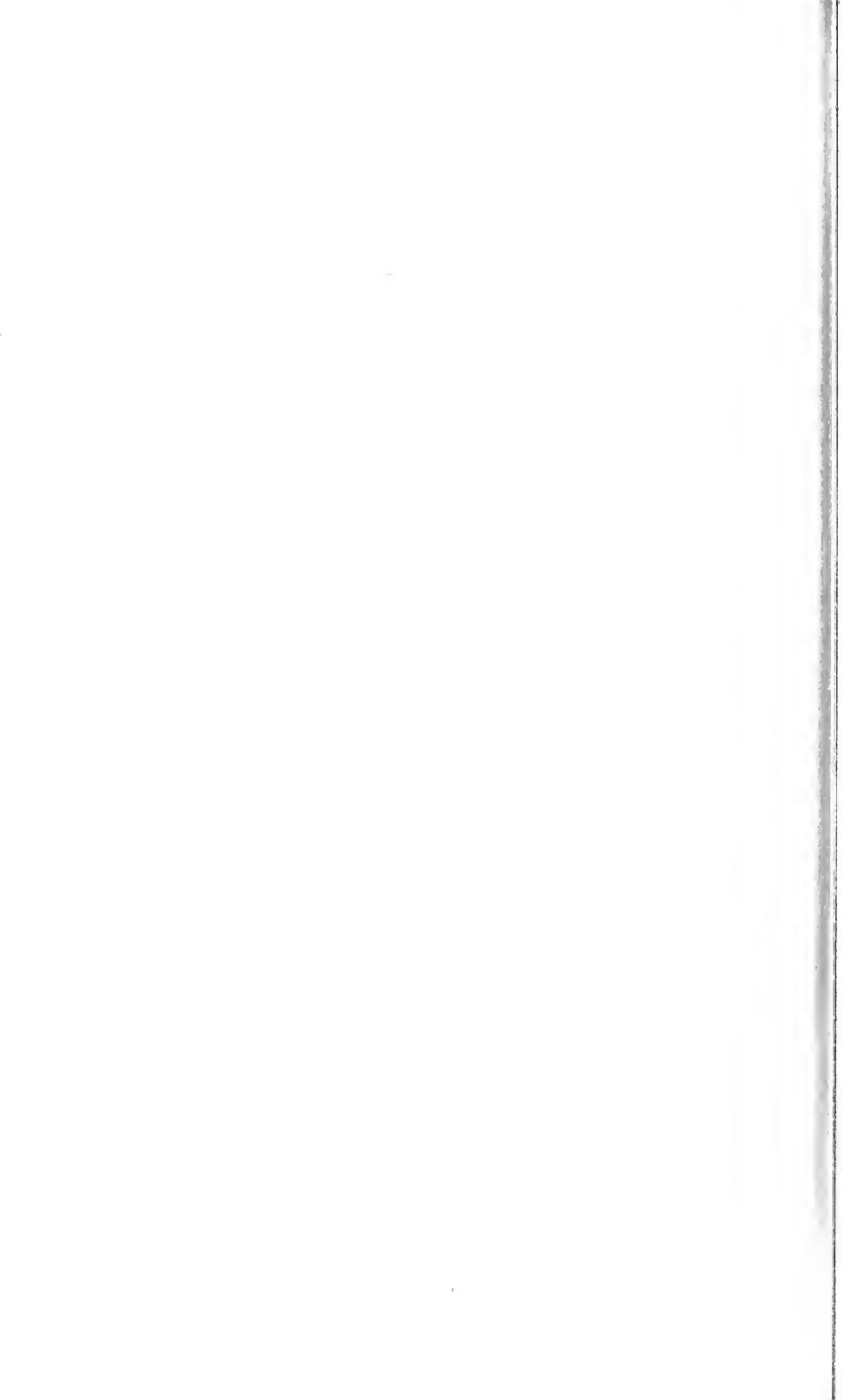


PLATE 37.

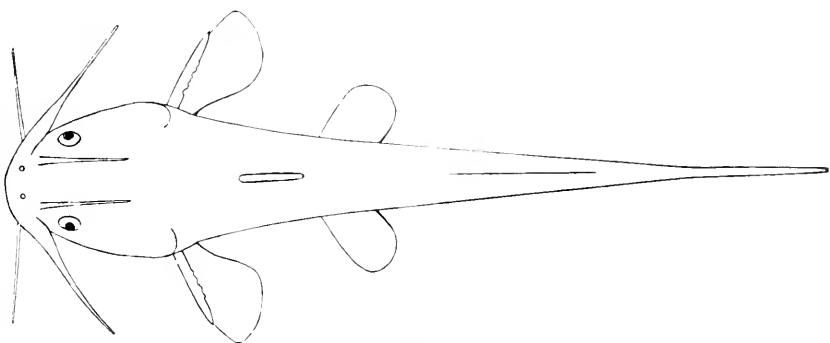


FIG. 57.—*Noturus insignis* (Rich.) G. & J.
Penn.

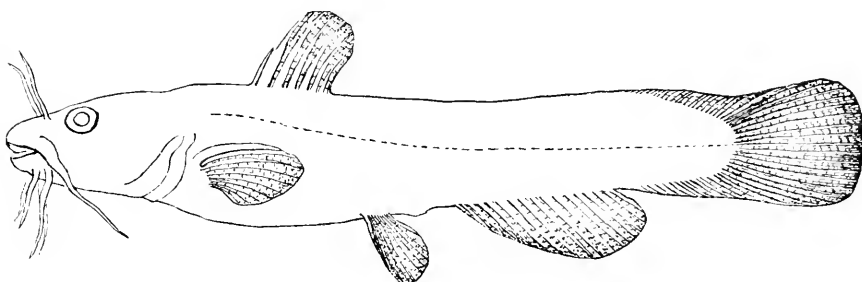


FIG. 57 (b).—*Noturus insignis* (Rich.) G. & J.
Penn.

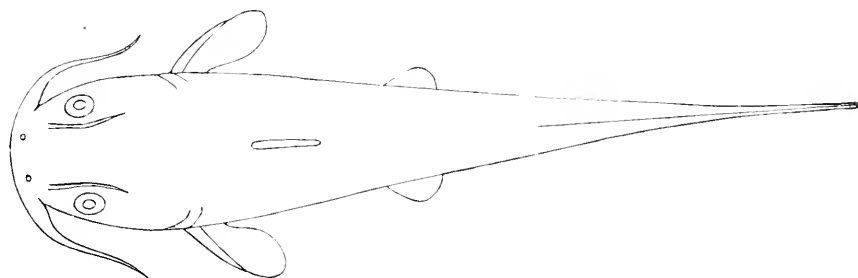


FIG. 57 (c).—*Noturus insignis* (Rich.) G. & J.
Penn.

PLATE 38.

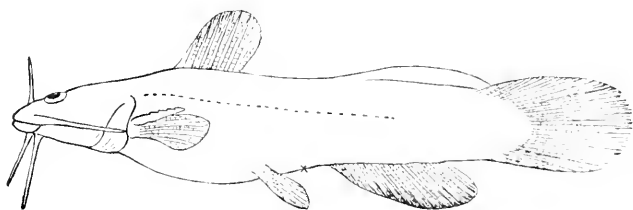


FIG. 58—*Noturus exilis* *Nelson*.
Root R., Wis. Nat size.

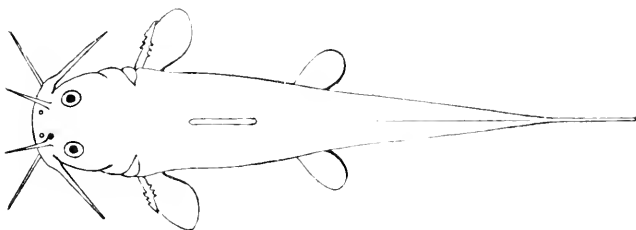


FIG. 59—*Noturus exilis* *Nelson*.
Root R., Wis. Nat. size.

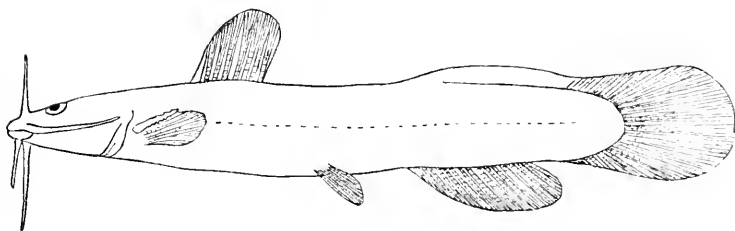


FIG. 59 (b)—*Noturus exilis* *Nelson*.
Illinois R. From one of three original types.

PLATE 39.

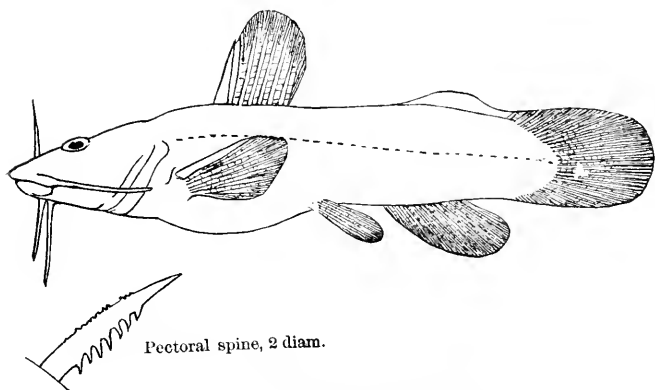


FIG. 60—*Noturus miurus* Jordan.
White R., Ind. Nat. size.

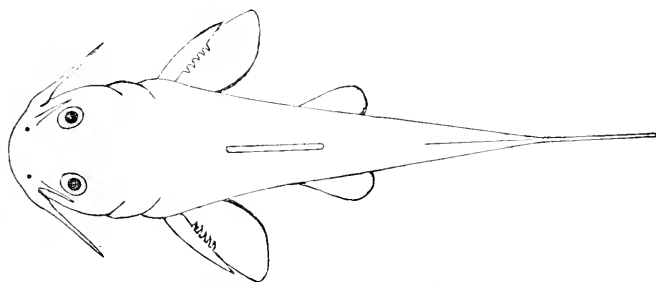


FIG. 61—*Noturus miurus* Jordan.
White R., Ind. Nat. size from type.

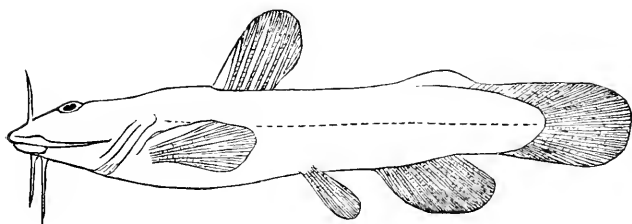
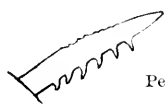
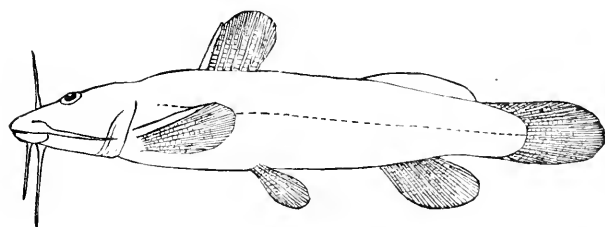


FIG. 61 (b)—*Noturus miurus* Jordan.
Ohio R., W. Va. Nat. size.

PLATE 10.



Pectoral spine, enlarged 2 diams.

FIG. 62.—*Noturus eleutherus* Jordan.
French Broad R. Type nat. size.

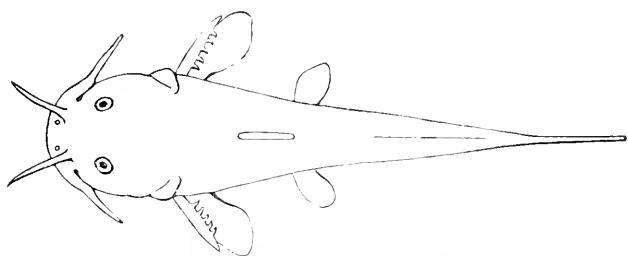


FIG. 63.—*Noturus eleutherus* Jordan.
French Broad R. Type nat. size.

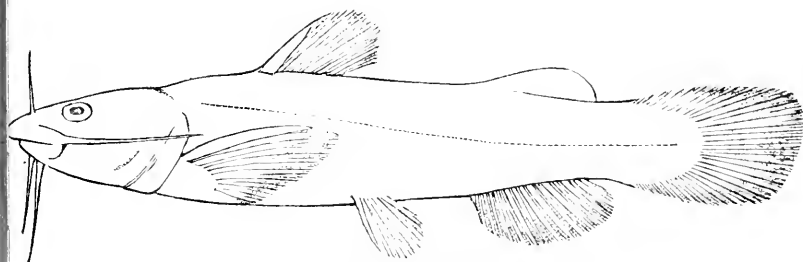


FIG. 63 (b)—*Noturus eleutherus* Jordan.
Tar River, N. C.

PLATE 41.

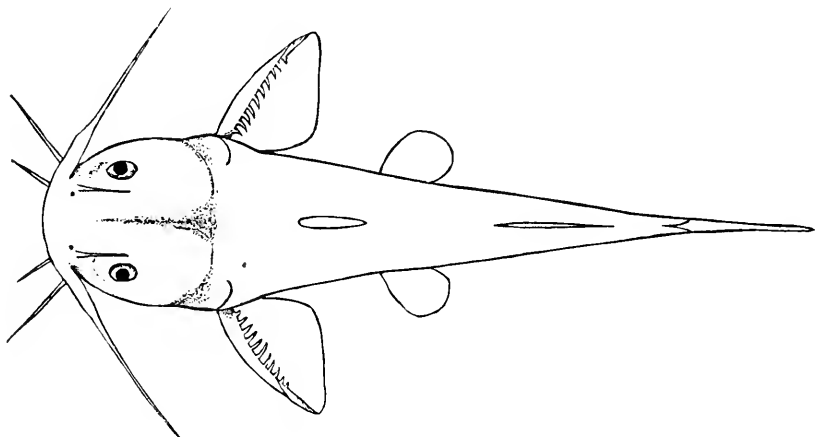
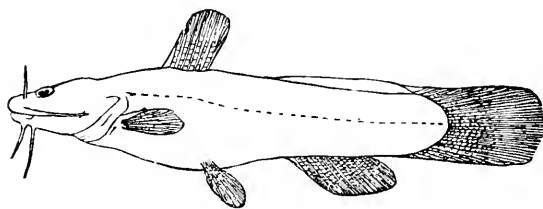


FIG. 63 (c)—*Noturus eleutherus* Jordan.
Tar River, N. C.



Pectoral spine, 2 diams.

FIG. 64—*Noturus leptacanthus* Jordan.
Etowah R., Ga. Type spec. Nat. size.

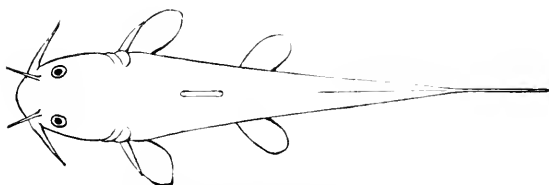


FIG. 65—*Noturus leptacanthus* Jordan.
Etowah R., Ga. Nat. size, type.

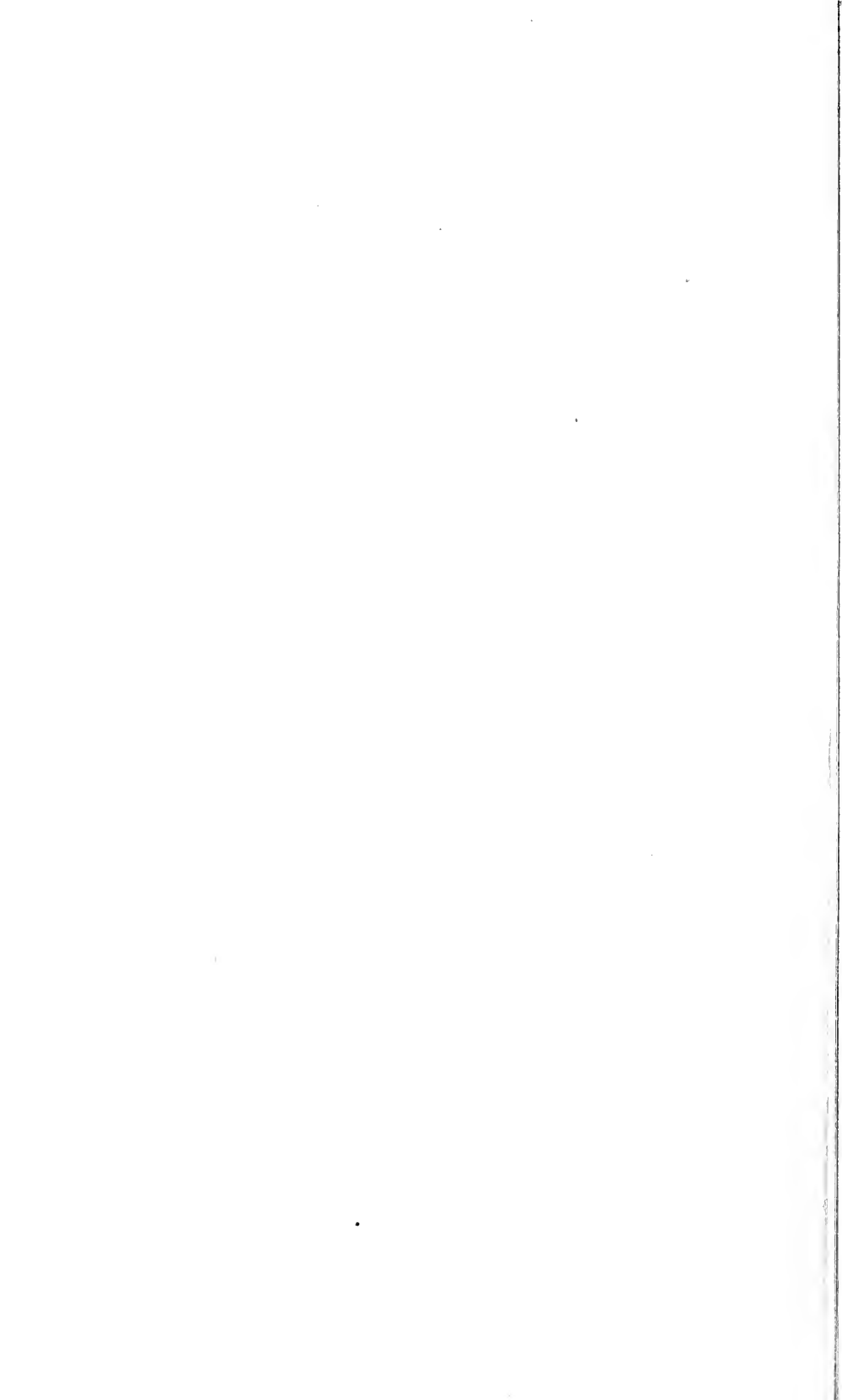


PLATE 42.

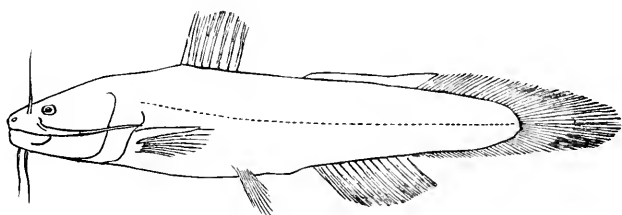


FIG. 66—*Noturus gyrinus* (Mitch.) Raf.
Hudson R. Nat. size.

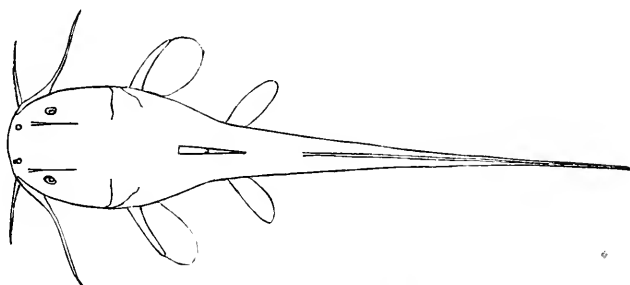
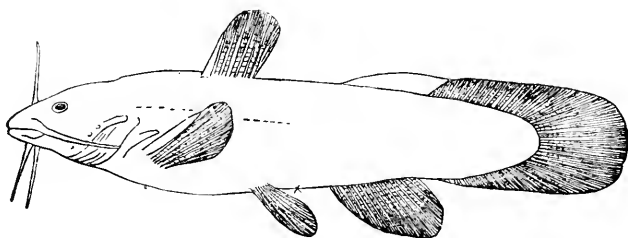


FIG. 67--*Noturus gyrinus* (Mitch.) Raf.
Hudson R.



Dentition of lower jaw.



Dentition of upper jaw.



FIG. 68—*Noturus sialis* Jordan.
White R., Ind. Nat. size.



Pectoral spine.

PLATE 43.

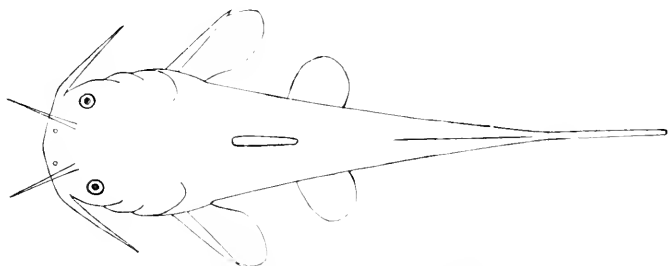


FIG. 69—*Noturus sialis* Jordan.
White River, Indiana. (Type, nat. size.)

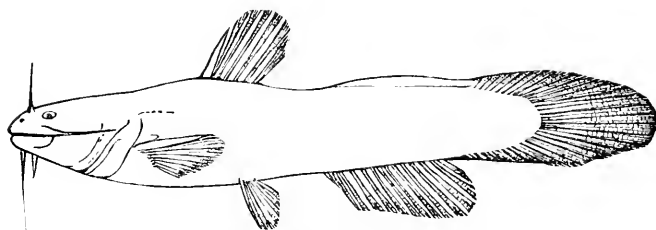


FIG. 69 (b)—*Noturus gyrinus* (Mitch.) Raf.
Hudson River. (Nat. size.)

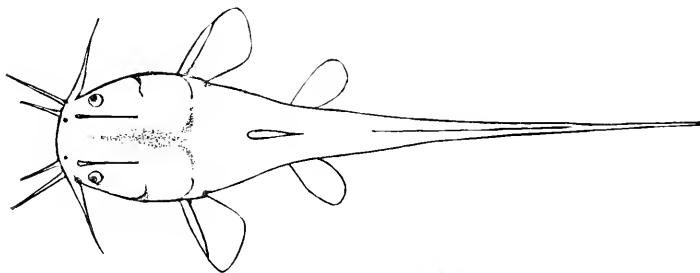


FIG. 69 (c)—*Noturus gyrinus* (Mitch.) Raf.
Hudson River. (Nat. size.)

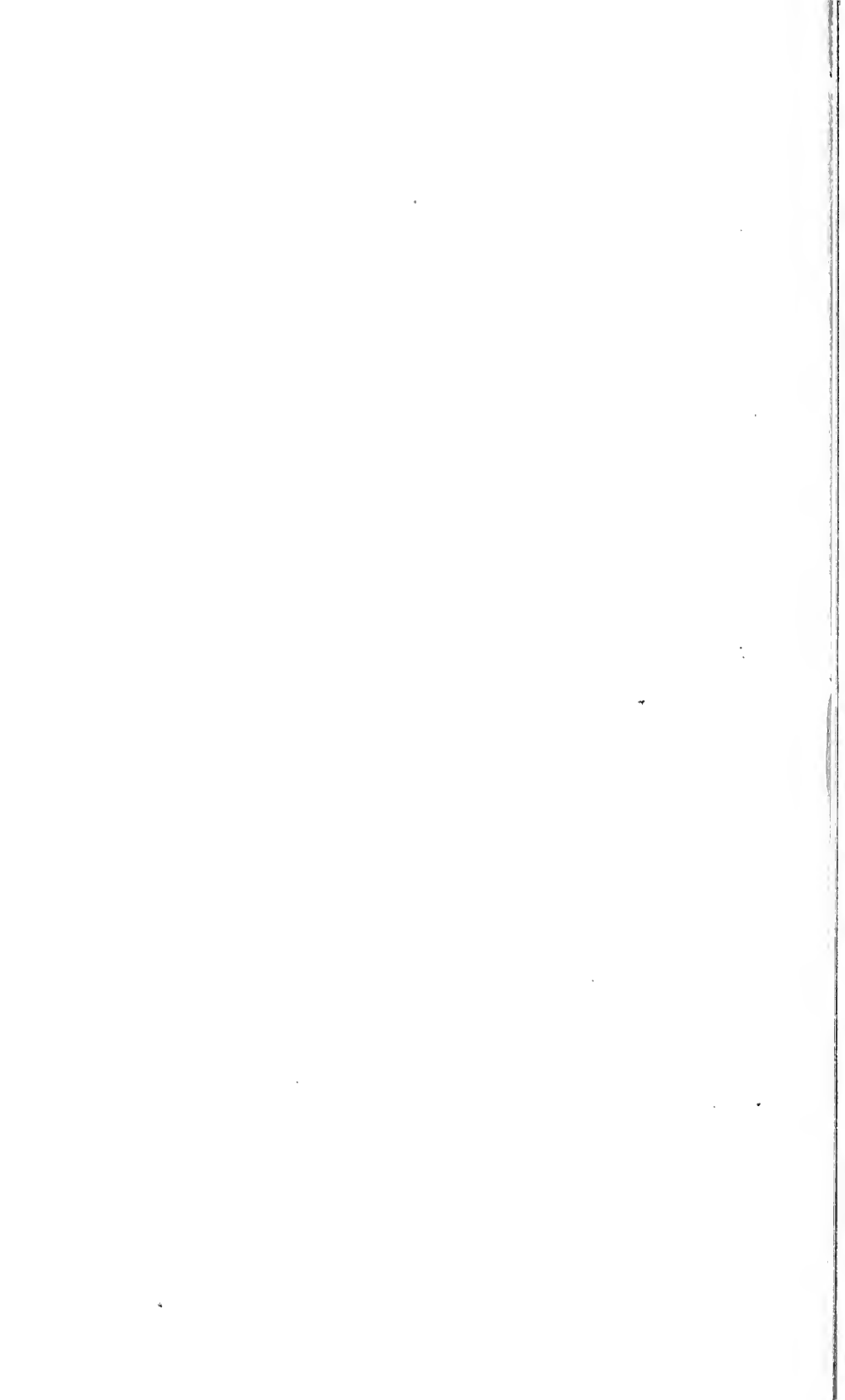


PLATE 44.

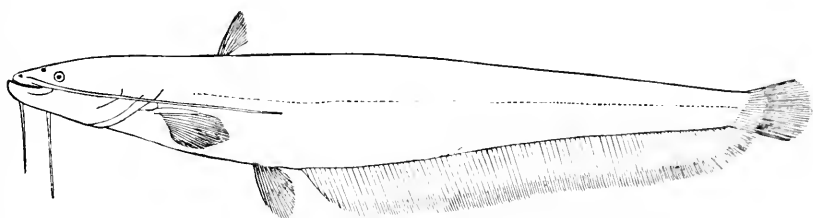
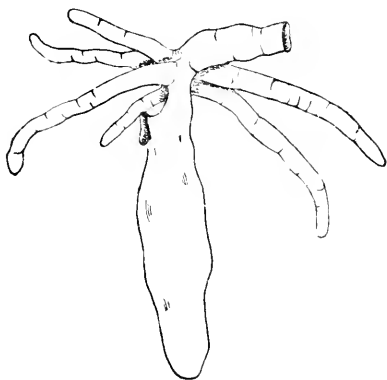
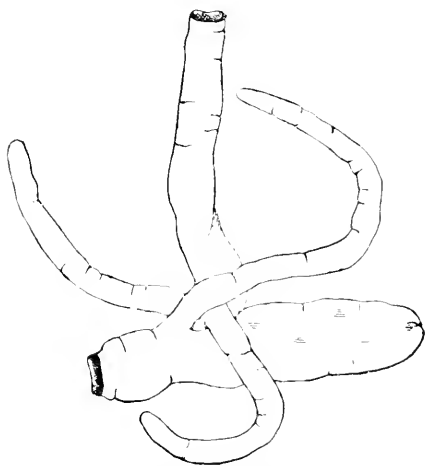


FIG. 70.—*Silurus glanis*, *Linn.*
European Catfish; Sheatfish.
Lake Neuchâtel, Switzerland.



Pyloric caeca (a)
FIG. 71.—*Stizostethium canadense* (*Smith*) *Jordan*.
Reduced one-half.



Pyloric caeca (b)
FIG. 72.—*Stizostethium salmoneum* *Raf.*
Reduced one-half.

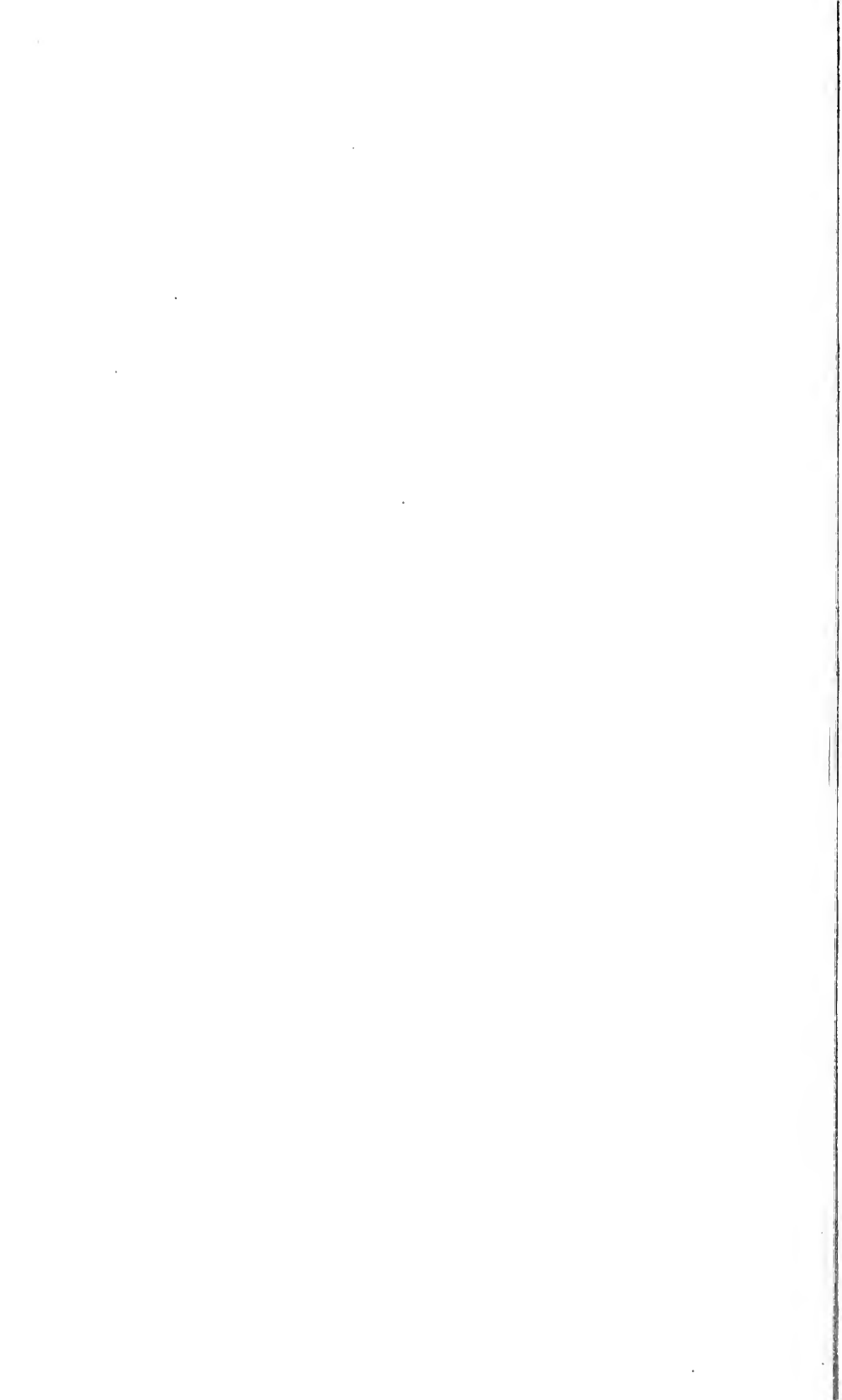


PLATE 45.

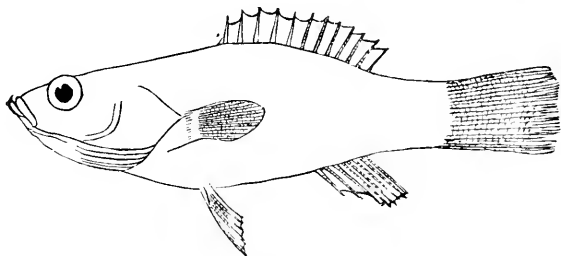


FIG. 73—*Elassoma zonata* Jordan.
Little Red R., Ark. Type enlarged 3 diams.

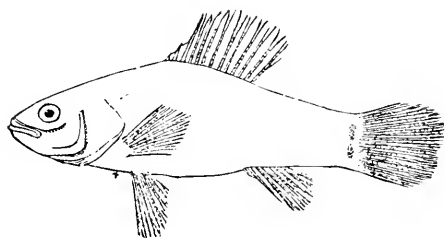
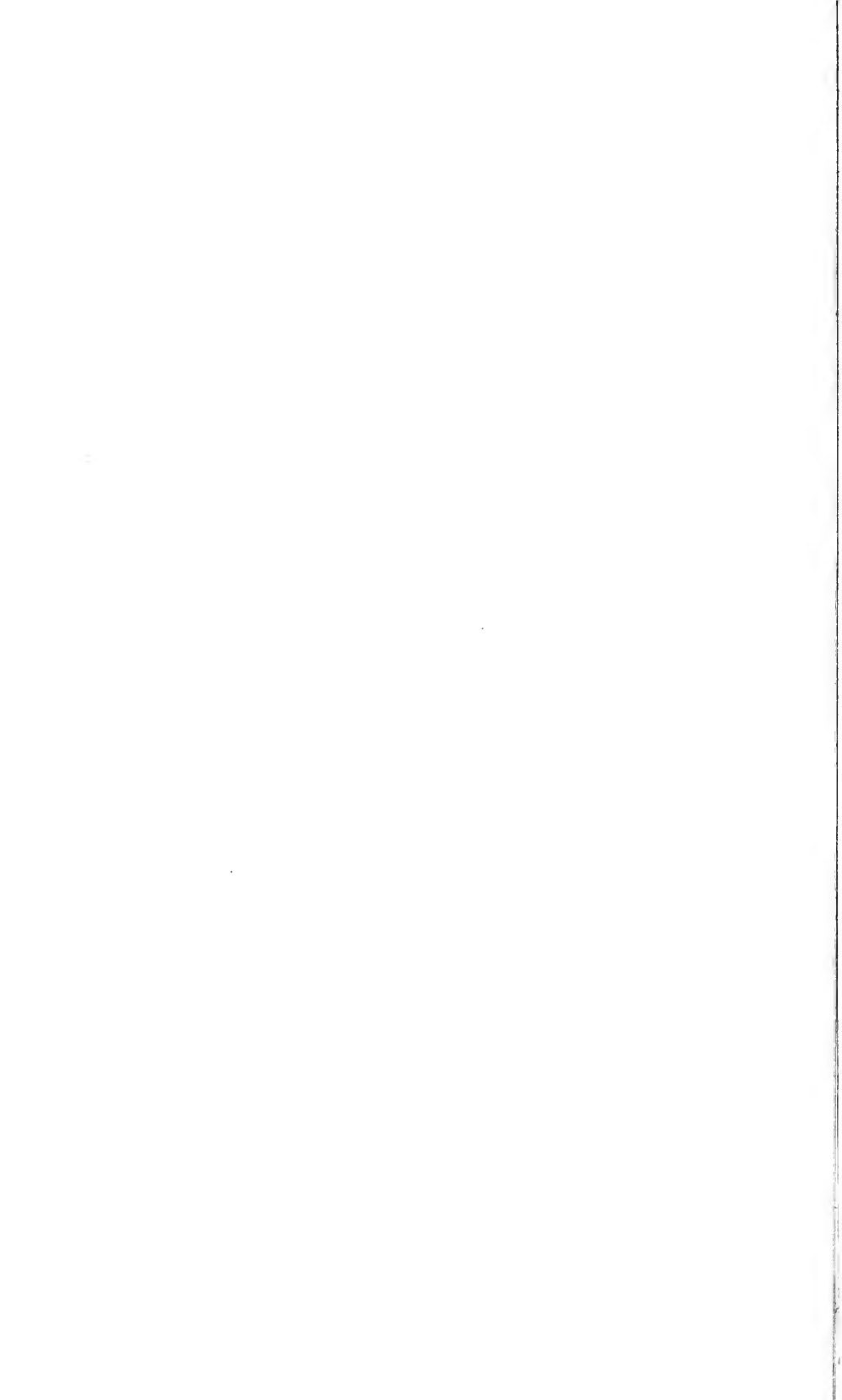
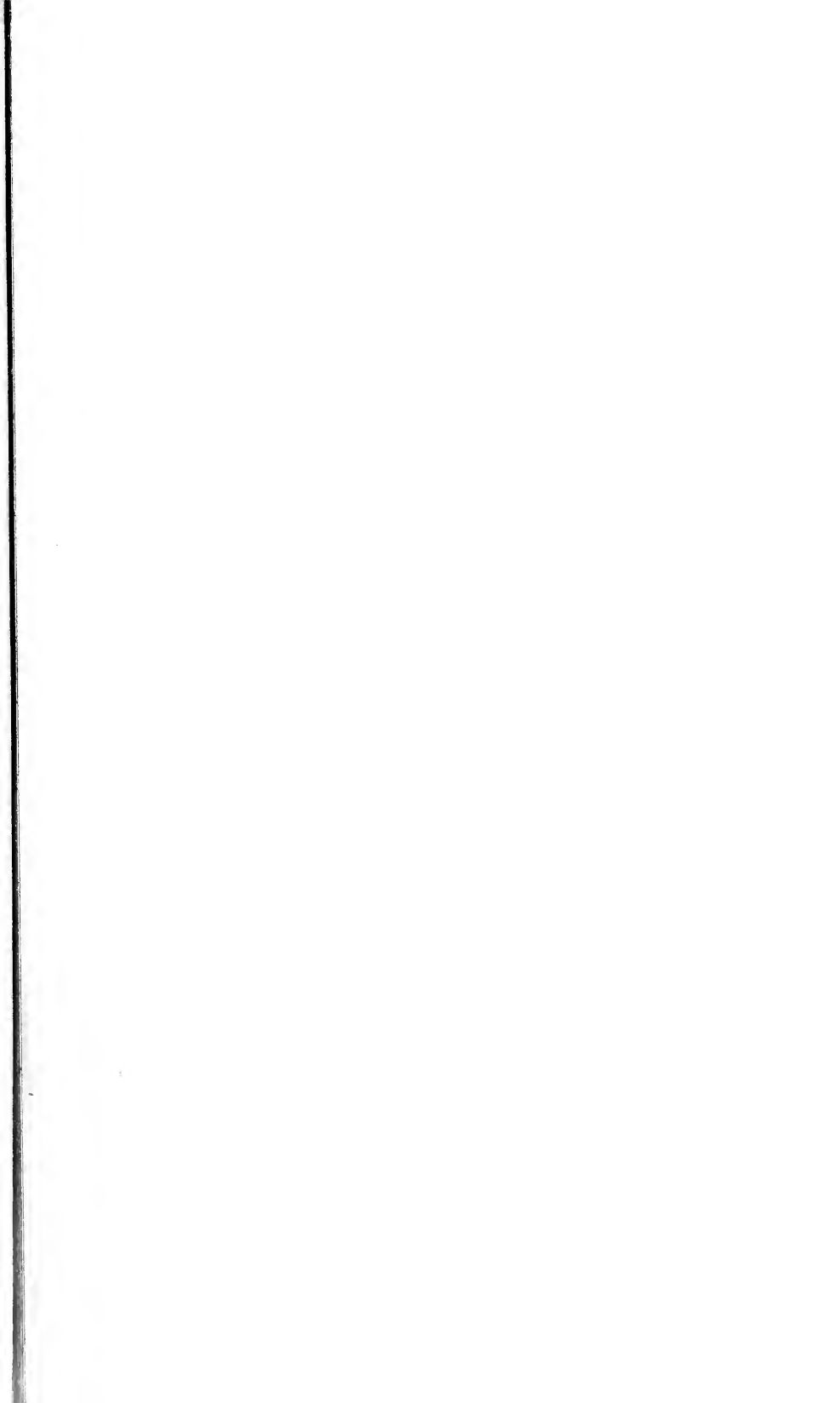
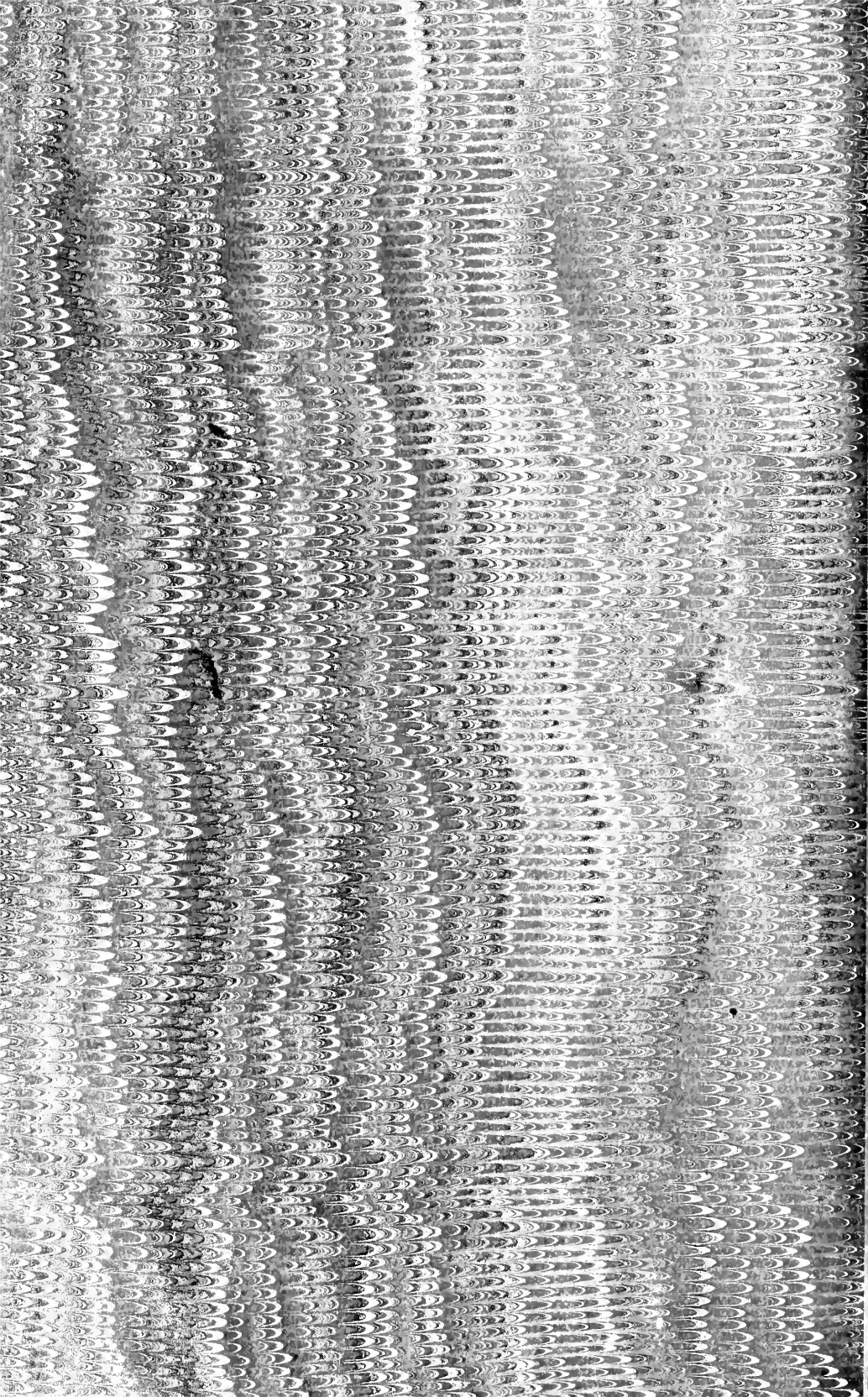


FIG. 74—*Asternotremia mesotrema* Jordan.
Little Red River, Ark.







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